JC03 Rec'd PCT/PTO 2 7 APR 2001

)RM EV 5	PTO-139O (M	fodified) U.S. DEPARTMENT OF	COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER	1					
			NSMITTAL LETTER T	O THE UNITED STATES		032931/0251						
	DESIGNATED/ELECTED OFFICE (DO/EO/US)											
CONCERNING A FILING UNDER 35 U.S.C. 371												
Us APPLICATION TO (It known & 30 F 4) 4 To be assigned												
11				INTERNATIONAL FILING DATE	TY DATE CLAIMED							
1		E OF IN		28 October 1999	28 C	October 1998	-					
1	TITLE OF INVENTION CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF											
Α	APPLICANT(S) FOR DO/EO/US Androw D. MURDIN Poymond P. COMEN and Joe WANG											
Andrew D. MURDIN, Raymond P. OOMEN and Joe WANG Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:												
	1.											
ŀ												
2	•		This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.									
3	•	This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).										
4			A proper Demand for International Preliminary Examination was made by the 19 th month from the earliest claimed priority date.									
5	•		A copy of the International Application as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (required only if not transmitted by the International Bureau). has been transmitted by the International Bureau. is not required, as the application was filed in the United States Receiving Office (RO/US)									
6			A translation of the International Application into English (35 U.S.C. 371(c)(2)).									
. 7	-		are transmitted herewith a have been transmitted by	ever, the time limit for making such a	Internat	ional Bureau).						
8			A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).									
9			An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).									
1	0.		A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).									
-	1.		Applicant claims small entity status under 37 CFR 1.27.									
It	em	ns 12. to 17. below concern other document(s) or information included:										
1	2.		An Information Disclosure State									
. 1	3.		An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.									
14.	4.	\square	A FIRST preliminary amendment. A SECOND or SUBSEQUENT preliminary amendment.									
1	5.		A substitute specification.									
1	6.											
1	7.		Other items or information:									

U.S. APPLICATION NO. (If known, see 37 C.F.R., 150 4 4 6 PCT/CA99/00992								- <u>-</u>	ATTORNEY'S DOCKET NUMBER 032931/0251		
18. ☑The following fees are submitted:									CALCULATION	ON	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5):											
Search Report has been prepared by the EPO or JPO											į
(37 CFR 1.482)	00										
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)											
Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO											
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)											
ENTER APPROPRIATE BASIC FEE AMOUNT = \$860.00											
Surcharge of \$130.00	Surcharge of \$130.00 for furnishing the oath or declaration later than 20										
Months from the earli	iest claimed prio	rity da	te (37 CFR 1.492(e	e))							
Claims	Number Filed		Included in Basic Fee		Extra Claims		Rate	e			,
Total Claims	39	-	20	=	19	×	\$18	.00	\$342	2.00	
Independent Claims	8	-	3	=	5	×	\$80	.00	\$400	0.00	
Multiple dependent cl	aim(s) (if applica	able)			1		\$270	.00			
TOTAL OF ABOVE CALCULATIONS = \$1602.00											
Reduction by ½ for filing by small entity, if applicable. \$0.00											
SUBTOTAL =									\$1602.00		
Processing fee of \$130.00 for furnishing English translation later the 20 months from the earliest claimed priority date (37 CFR 1.492(f).											
TOTAL NATIONAL FEE = \$1602.00											
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +											
TOTAL FEES ENCLOSED = \$1602.00											
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										\$	
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a. 🛛 A check in	the amount of \$	1602.0	00 to cover the above	ve fe	es is enclose	d.					
b. 🗌 Please char	ge my Deposit A	Accour	nt No. <u>19-0741</u> in th	he an	nount of \$0.	00 to	o the abov	e fees	. A duplicate copy	of this	sheet is enclosed.
			orized to charge an			whi	ch may be	e requi	ired, or credit any o	verpa	yment to Deposit
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.											
(a) or (b)) must	or med and grai		. restore the applica		to pending o				>(
SEND ALL CORRESPONDENCE TO:								V			
FOLEY & LARDNER								7			
3000 K Street, N.W., Suite 500											
Washington, DC 20007 NAME BERNHARD D. SAXE									D. SAXE		
							REGISTRATION NUMBER 28,665				

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No: 032931/0251

In re patent application of MURDIN, Andrew D. *et al.*

Serial No.: Not Assigned

Group Art Unit: Not Assigned

(U.S Entry of PCT/CA99/00992)

Filed: October 28, 1999 (International Filing Date) Examiner: Not Assigned

US Entry Date: April 27, 2001

For: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

AND USES THEREOF

AMENDMENT ACCOMPANYING SUBMISSION OF SEQUENCE LISTING

Assistant Commissioner for Patents Washington, D.C. 20231 **Box SEQUENCE**

Sir:

In order to comply with the requirements for patent applications containing amino acid and/or sequence disclosures, please amend the application as follows:

IN THE SPECIFICATION:

At the end of the specification, please insert the printed Sequence Listing submitted concurrently herewith.

REMARKS

Applicants submit this Amendment to insert the required references to SEQ ID NOS of the Sequence Listing filed concurrently herewith, and to indicate the insertion point for the Sequence Listing. Applicants respectfully request examination on the merits of this application.

Respectfully submitted;

June 22, 2001 Date

loy/D/Morrow Reg. No. 30,911



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No: 032931/0251

In re patent application of MURDIN, Andrew D. et al.

Serial No.: U.S. National Entry

of PCT/CA99/00992

Group Art Unit: 1643

Filed: October 28, 1999

Examiner: Not assigned

For: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND

USES THEREOF

STATEMENT TO SUPPORT FILING AND SUBMISSION IN **ACCORDANCE** with 37 C.F.R. §§ 1.821-1.825

Assistant Commissioner for Patents Washington, D.C. 20231 **Box SEQUENCE**

Sir:

In connection with a Sequence Listing submitted concurrently herewith, the undersigned hereby states that:

- the submission, filed herewith in accordance with 37 C.F.R. § 1.821(g), does not include new matter; and
- the content of the attached paper copy and the attached computer 2. readable copy of the Sequence Listing, submitted in accordance with 37 C.F.R. § 1.821(c) and (e), respectively, are the same.

Respectfully submitted,

25 May 2001 Date

531 Rec'd PC. 27 APR 2001

Applicant:

Andrew D. MURDIN

Title:

CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

AND USES THEREOF

Appl. No.:

To be assigned

Filing Date:

April 27, 2001

Examiner:

Unassigned

Art Unit:

Unassigned

PRELIMINARY AMENDMENT

Commissioner for Patents Washington, D.C. 20231

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Sir:

Prior to examination of the above-identified application, Applicants respectfully request that the following amendments be entered into the application:

10 **IN THE CLAIMS**:

Please cancel claims 1-24 in their entirety without prejudice or disclaimer and therefore insert new claims 25-63.

- 15 25. (New) A nucleic acid molecule comprising a nucleic acid sequence which encodes a polypeptide selected from any of:
 - (a) SEQ ID Nos: 27 to 45;
 - (b) an immunogenic fragment comprising at least 12 consecutive amino acids from a polypeptide of (a); and
- (c) a polypeptide of (a) or (b) which has been modified without loss of immunogenicity, wherein said modified polypeptide is at least 75% identical in amino acid sequence to the corresponding polypeptide of (a) or (b).

- 26. (New) A nucleic acid molecule comprising a nucleic acid sequence selected from any of:
 - (a) SEQ ID Nos: 1 to 26;
- 5 (b) a sequence which encodes a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
 - (c) a sequence comprising at least 38 consecutive nucleotides from any one of the nucleic acid sequences of (a) and (b); and
- (d) a sequence which encodes a polypeptide which is at least 75% identical in amino acid sequence to any one of the polypeptides encoded by SEQ ID Nos: 1 to 26.
 - 27. (New) A nucleic acid molecule comprising a nucleic acid sequence which is antisense to the nucleic acid molecule of claim 25.
 - 28. (New) A nucleic acid molecule comprising a nucleic acid sequence which encodes a fusion protein, said fusion protein comprising a polypeptide encoded by a nucleic acid molecule according to claim 25 and a second polypeptide.
 - 29. (New) The nucleic acid molecule of claim 28 wherein the second polypeptide is a heterologous signal peptide.
 - 30. (New) The nucleic acid molecule of claim 28 wherein the second polypeptide has adjuvant activity.
- 20 31. (New) A nucleic acid molecule according to claim 25, operatively linked to one or more expression control sequences.
 - 32. (New) A vaccine comprising a vaccine vector and at least one first nucleic acid selected from any of:
 - (i) SEQ ID Nos: 1 to 26;

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25 (ii) a nucleic acid sequence which encodes a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;

- (iii) a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of the nucleic acid sequences of (i) and (ii);
- (iv) a nucleic acid sequence which encodes a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- 5 (v) a nucleic acid sequence which encodes a polypeptide whose sequence is set forth in any one of SEQ ID Nos: 27 to 45;
 - (vi) a nucleic acid sequence which encodes an immunogenic fragment comprising at least 12 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
- (vii) a nucleic acid sequence which encodes a polypeptide as defined in (v) or an immunogenic fragment as defined in (vi) which has been modified without loss of immunogenicity, wherein said modified polypeptide or fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (v) or the corresponding fragment of (vi);

wherein each first nucleic acid is capable of being expressed.

- 33. (New) A vaccine comprising a vaccine vector and at least one first nucleic acid encoding a fusion protein, wherein the fusion protein comprises:
 - (a) a first polypeptide selected from any of:
 - (i) a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
 - (ii) a polypeptide encoded by a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of SEQ ID Nos: 1 to 26;
- 20 (iii) a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
 - (iv) a polypeptide whose sequence is set forth in any one of SEQ ID Nos: 27 to 45;
 - (v) an immunogenic fragment comprising at least 12 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
- (vi) a polypeptide as defined (iv) or an immunogenic fragment as defined in (v) which has been modified without loss of immunogenicity, wherein said modified polypeptide or fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (iv) or the corresponding fragment of (v); and

(b) a second polypeptide;

wherein each first nucleic acid is capable of being expressed.

- 34. (New) The vaccine of claim 33 wherein the second polypeptide is a heterologous signal peptide.
- 5 35. (New) The vaccine of claim 33 wherein the second polypeptide has adjuvant activity.
 - 36. (New) The vaccine of claim 32 wherein each first nucleic acid is operatively linked to one or more expression control sequences.
- 37. (New) A vaccine according to claim 32 wherein each first nucleic acid is expressed as a polypeptide, and wherein the vaccine comprises a second nucleic acid encoding an additional polypeptide which enhances the immune response to the polypeptide expressed by the first nucleic acid.
 - 38. (New) The vaccine of claim 37 wherein the second nucleic acid encodes an additional *Chlamydia* polypeptide.
- 39. (New) A pharmaceutical composition comprising a nucleic acid according to claim 25 and a pharmaceutically acceptable carrier.
 - 40. (New) A pharmaceutical composition comprising a vaccine according to claim 32 and a pharmaceutically acceptable carrier.
 - 41. (New) A unicellular host transformed with the nucleic acid molecule of claim 31.
- 42. (New) An isolated nucleic acid probe of 5 to 100 nucleotides which hybridizes under stringent conditions to any one of nucleic acid molecules of SEQ ID Nos: 1 to 26, or to a complementary or anti-sense sequence of said nucleic acid molecule.
 - 43. (New) A primer of 10 to 40 nucleotides which hybridizes under stringent conditions to any one of nucleic acid molecules of SEQ ID Nos: 1 to 26, or to a homolog or complementary or anti-sense sequence of said nucleic acid molecule.
- 25 44. (New) A polypeptide encoded by a nucleic acid sequence according to claim 26.

- 45. (New) A polypeptide comprising an amino acid sequence selected from any of:
 - (a) SEQ ID Nos: 27 to 45;
- (b) an immunogenic fragment comprising at least 12 consecutive amino acids from a polypeptide of (a); and
- 5 (c) a polypeptide of (a) or (b) which has been modified without loss of immunogenicity, wherein said modified polypeptide is at least 75% identical in amino acid sequence to the corresponding polypeptide of (a) or (b).
 - 46. (New) A fusion protein comprising a polypeptide of claim 44 and a second polypeptide.
- 10 47. (New) The fusion protein of claim 46 wherein the second polypeptide is a heterologous signal peptide.
 - 48. (New) The fusion protein of claim 46 wherein the second polypeptide has adjuvant activity.
- 49. (New) A method for producing a polypeptide, comprising the step of culturing a unicellular host of claim 41 and recovering the resultant polypeptide.
 - 50. (New) An antibody against the polypeptide of claim 44.
 - 51. (New) A vaccine comprising at least one first polypeptide selected from any of:
 - (i) a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- (ii) a polypeptide encoded by a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of SEO ID Nos: 1 to 26:
 - (iii) a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
 - (iv) a polypeptide whose sequence is set forth in any one of SEO ID Nos: 27 to 45;
- (v) an immunogenic fragment comprising at least 12 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
 - (vi) a polypeptide as defined in (iv) or an immunogenic fragment as defined in (v) which has been modified without loss of immunogenicity, wherein said modified polypeptide or

fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (iv) or the corresponding fragment of (v).

- 52. (New) A vaccine comprising at least one fusion protein, wherein the fusion protein comprises:
 - (a) a first polypeptide selected from any of:

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- (i) a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- (ii) a polypeptide encoded by a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of SEQ ID Nos: 1 to 26;
- (iii) a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
 - (iv) a polypeptide whose sequence is set forth in any one of SEQ ID Nos: 27 to 45;
 - (v) an immunogenic fragment comprising at least 12 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
- (vi) a polypeptide as defined (iv) or an immunogenic fragment as defined in (v)
 which has been modified without loss of immunogenicity, wherein said modified polypeptide or fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (iv) or the corresponding fragment of (v); and
 - (b) a second polypeptide.
- 53. (New) The vaccine of claim 52 wherein the second polypeptide is a heterologous signal peptide.
 - 54. (New) The vaccine of claim 52 wherein the second polypeptide has adjuvant activity.
 - 55. (New) A vaccine comprising at least one first polypeptide according to claim 44 and an additional polypeptide which enhances the immune response to the first polypeptide.
- 56. (New) The vaccine of claim 55 wherein the additional polypeptide comprises a *Chlamydia* polypeptide.
 - 57. (New) A pharmaceutical composition comprising a polypeptide according to claim 44 and a pharmaceutically acceptable carrier.

- 58. (New) A pharmaceutical composition comprising a vaccine according to claim 51 and a pharmaceutically acceptable carrier.
- 59. (New) A pharmaceutical composition comprising an antibody according to claim 50 and a pharmaceutically acceptable carrier.
- 5 60. (New) A method for preventing or treating *Chlamydia* infection comprising administering to a patient an effective amount of:
 - (a) a nucleic acid molecule according to claim 26; or
 - (b) a vaccine comprising a vaccine vector and at least one first nucleic acid according to claim 26; or
- (c) a pharmaceutical composition comprising a nucleic acid according to claim 26 and a pharmaceutically acceptable carrier; or
 - (d) a polypeptide encoded by a nucleic acid sequence according to claim 26; or
 - (e) an antibody against a polypeptide encoded by a nucleic acid sequence according to claim 26.
- 15 61. (New) A method of detecting *Chlamydia* infection comprising the step of contacting a body fluid of a mammal to be tested, with a component selected from any one of:
 - (a) a nucleic acid molecule according to claim 26;
 - (b) a polypeptide encoded by a nucleic acid sequence according to claim 26; and
 - (c) an antibody against a polypeptide encoded by a nucleic acid sequence according to claim 26.
 - 62. (New) A diagnostic kit comprising instructions for use and a component selected from any one of:
 - (a) a nucleic acid molecule according to claim 26;

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- (b) a polypeptide encoded by a nucleic acid sequence according to claim 26; and
- 25 (c) an antibody against a polypeptide encoded by a nucleic acid sequence according to claim 26.
 - 63. (New) A method for identifying a polypeptide of claim 44 which induces an immune response effective to prevent or lessen the severity of *Chlamydia* infection in a mammal previously immunized with polypeptide, comprising the steps of:

- (a) immunizing a mouse with a polypeptide of claim 44; and
- (b) inoculating the immunized mouse with Chlamydia;

wherein the polypeptide which prevents or lessens the severity of *Chlamydia* infection in the immunized mouse compared to a non-immunized control mouse is identified.

REMARKS

The Examiner is respectfully requested to enter the above amendment prior to examination of the instant application.

Respectfully submitted,

Date April 27, 2001

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Bernhard D. Saxe Attorney for Applicant Registration No. 28,665 WO 00/24765

531 Rec'd PCT/F-PCT/247 APR 2001

TITLE OF INVENTION

CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

5 REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/106034, filed October 28, 1998, U.S. Provisional Application No. 60/106039, filed October 28, 1998, U.S. Provisional Application No. 60/106042, filed October

- 10 28, 1998, U.S. Provisional Application No. 60/106044, filed October 28, 1998, U.S. Provisional Application No. 60/106072, filed October 29, 1998, U.S. Provisional Application No. 60/106073, filed October 29, 1998, U.S. Provisional Application No. 60/106074, filed October 29, 1998, U.S. Provisional
- 15 Application No. 60/106087, filed October 29, 1998, U.S. Provisional Application No. 60/106587, filed November 2, 1998, U.S. Provisional Application No. 60/106588, filed November 2, 1998, U.S. Provisional Application No. 60/107089, filed November 2, 1998, U.S. Provisional Application No. 60/107034, filed
- 20 November 2, 1998 and U.S. Provisional Application No. 60/107035, filed November 2, 1998.

FIELD OF INVENTION

The present invention relates to *Chlamydia* antigens 25 and corresponding DNA molecules, which can be used to prevent and treat *Chlamydia* infection in mammals, such as humans.

BACKGROUND OF THE INVENTION

Chlamydiae are prokaryotes. They exhibit morphologic 30 and structural similarities to gram-negative bacteria including a trilaminar outer membrane, which contains lipopolysaccharide and several membrane proteins that are structurally and functionally analogous to proteins found in *E coli*. They are obligate intra-cellular parasites with a unique biphasic life

cycle consisting of a metabolically inactive but infectious extracellular stage and a replicating but non-infectious intracellular stage. The replicative stage of the life-cycle takes place within a membrane-bound inclusion which sequesters the bacteria away from the cytoplasm of the infected host cell.

- C. pneumoniae is a common human pathogen, originally described as the TWAR strain of Chlamydia psittaci but subsequently recognised to be a new species. C. pneumoniae is antigenically, genetically and morphologically distinct from other chlamydia species (C. trachomatis, C. pecorum and C. psittaci). It shows 10% or less DNA sequence homology with either of C.trachomatis or C.psittaci.
- C. pneumoniae is a common cause of community acquired pneumonia, only less frequent than Streptococcus pneumoniae and 15 Mycoplasma pneumoniae (Grayston et al. (1995) Journal of Infectious Diseases 168:1231; Campos et al. (1995) Investigation of Ophthalmology and Visual Science 36:1477). It can also cause upper respiratory tract symptoms and disease, including bronchitis and sinusitis (Grayston et al. (1995) Journal of Infectious Diseases 168:1231; Grayston et al (1990) Journal of Infectious Diseases 161:618; Marrie (1993) Clinical Infectious Diseases. 18:501; Wang et al (1986) Chlamydial infections). Cambridge University Press, Cambridge. p. 329The great majority of the adult population (over 60%) has antibodies to C.
- 25 pneumoniae (Wang et al (1986) Chlamydial infections. Cambridge University Press, Cambridge. p. 329), indicating past infection which was unrecognized or asymptomatic.
- C. pneumoniae infection usually presents as an acute respiratory disease (i.e., cough, sore throat, hoarseness, and 30 fever; abnormal chest sounds on auscultation). For most patients, the cough persists for 2 to 6 weeks, and recovery is slow. In approximately 10% of these cases, upper respiratory tract infection is followed by bronchitis or pneumonia. Furthermore, during a C. pneumoniae epidemic, subsequent

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co-infection with pneumococcus has been noted in about half of these pneumonia patients, particularly in the infirm and the elderly. As noted above, there is more and more evidence that *C. pneumoniae* infection is also linked to diseases other than 5 respiratory infections.

The reservoir for the organism is presumably people. In contrast to C. psittaci infections, there is no known bird or animal reservoir. Transmission has not been clearly defined. It may result from direct contact with secretions, from fomites, or 10 from airborne spread. There is a long incubation period, which may last for many months. Based on analysis of epidemics, C. pneumoniae appears to spread slowly through a population (caseto-case interval averaging 30 days) because infected persons are inefficient transmitters of the organism. Susceptibility to C. 15 pneumoniae is universal. Reinfections occur during adulthood, following the primary infection as a child. C. pneumoniae appears to be an endemic disease throughout the world, noteworthy for superimposed intervals of increased incidence (epidemics) that persist for 2 to 3 years. C.trachomatis 20 infection does not confer cross-immunity to C. pneumoniae. Infections are easily treated with oral antibiotics, tetracycline or erythromycin (2 g/d, for at least 10 to 14 d). A recently developed drug, azithromycin, is highly effective as a single-dose therapy against chlamydial infections.

In most instances, *C. pneumoniae* infection is often mild and without complications, and up to 90% of infections are subacute or unrecognized. Among children in industrialized countries, infections have been thought to be rare up to the age of 5 y, although a recent study (E Normann *et al*, Chlamydia pneumoniae in children with acute respiratory tract infections, Acta Paediatrica, 1998, Vol 87, Iss 1, pp 23-27) has reported that many children in this age group show PCR evidence of infection despite being seronegative, and estimates a prevalence of 17-19% in 2-4 y olds. In developing countries, the

seroprevalence of *C. pneumoniae* antibodies among young children is elevated, and there are suspicions that *C. pneumoniae* may be an important cause of acute lower respiratory tract disease and mortality for infants and children in tropical regions of the 5 world.

From seroprevalence studies and studies of local epidemics, the initial *C. pneumoniae* infection usually happens between the ages of 5 and 20 y. In the USA, for example, there are estimated to be 30,000 cases of childhood pneumonia each 10 year caused by *C. pneumoniae*. Infections may cluster among groups of children or young adults (e.g., school pupils or military conscripts).

- C. pneumoniae causes 10 to 25% of community-acquired lower respiratory tract infections (as reported from Sweden, 15 Italy, Finland, and the USA). During an epidemic, C. pneumonia infection may account for 50 to 60% of the cases of pneumonia. During these periods, also, more episodes of mixed infections with S. pneumoniae have been reported.
- Reinfection during adulthood is common; the clinical 20 presentation tends to be milder. Based on population seroprevalence studies, there tends to be increased exposure with age, which is particularly evident among men. Some investigators have speculated that a persistent, asymptomatic C. pneumoniae infection state is common.
- In adults of middle age or older, *C. pneumoniae* infection may progress to chronic bronchitis and sinusitis. A study in the USA revealed that the incidence of pneumonia caused by *C. pneumoniae* in persons younger than 60 years is 1 case per 1,000 persons per year; but in the elderly, the disease
- 30 incidence rose three-fold. *C. pneumoniae* infection rarely leads to hospitalization, except in patients with an underlying illness.

Of considerable importance is the association of atherosclerosis and *C. pneumoniae* infection. There are several

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epidemiological studies showing a correlation of previous infections with *C. pneumoniae* and heart attacks, coronary artery and carotid artery disease (Saikku *et al.*(1988) Lancet;ii:983; Thom *et al.* (1992) JAMA 268:68; Linnanmaki *et al.* (1993),

- 5 Circulation 87:1030; Saikku et al. (1992)Annals Internal Medicine 116:273; Melnick et al(1993) American Journal of Medicine 95:499). Moreover, the organisms has been detected in atheromas and fatty streaks of the coronary, carotid, peripheral arteries and aorta (Shor et al. (1992) South African. Medical
- 10 Journal 82:158; Kuo et al. (1993) Journal of Infectious Diseases 167:841; Kuo et al. (1993) Arteriosclerosis and Thrombosis 13:1500; Campbell et al (1995) Journal of Infectious Diseases 172:585; Chiu et al. Circulation, 1997 (In Press)). Viable C. pneumoniae has been recovered from the coronary and carotid
- 15 artery (Ramirez et al (1996) Annals of Internal Medicine 125:979; Jackson et al. Abst. K121, p272, 36th ICAAC, 15-18 Sept. 1996, New Orleans). Furthermore, it has been shown that C. pneumoniae can induce changes of atherosclerosis in a rabbit model (Fong et al (1997) Journal of Clinical Microbiolology
- 20 35:48). Taken together, these results indicate that it is highly probable that *C. pneumoniae* can cause atherosclerosis in humans, though the epidemiological importance of chlamydial atherosclerosis remains to be demonstrated.

A number of recent studies have also indicated an 25 association between *C. pneumoniae* infection and asthma. Infection has been linked to wheezing, asthmatic bronchitis, adult-onset asthma and acute exacerbations of asthma in adults, and small-scale studies have shown that prolonged antibiotic treatment was effective at greatly reducing the severity of the

30 disease in some individuals (Hahn DL, et al. Evidence for Chlamydia pneumoniae infection in steroid-dependent asthma. Ann Allergy Asthma Immunol. 1998 Jan; 80(1): 45-49.; Hahn DL, et al. Association of Chlamydia pneumoniae IgA antibodies with recently symptomatic asthma. Epidemiol Infect. 1996 Dec;

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117(3): 513-517; Bjornsson E, et al. Serology of chlamydia in relation to asthma and bronchial hyperresponsiveness. Scand J Infect Dis. 1996; 28(1): 63-69.; Hahn DL. Treatment of Chlamydia pneumoniae infection in adult asthma: a before-after trial. J 5 Fam Pract. 1995 Oct; 41(4): 345-351.; Allegra L, et al. Acute exacerbations of asthma in adults: role of Chlamydia pneumoniae infection. Eur Respir J. 1994 Dec; 7(12): 2165-2168.; Hahn DL, et al. Association of Chlamydia pneumoniae (strain TWAR) infection with wheezing, asthmatic bronchitis, and adult-onset 10 asthma. JAMA. 1991 Jul 10; 266(2): 225-230).

In light of these results a protective vaccine against C. pneumoniae infection would be of considerable importance. There is not yet an effective vaccine for any human chlamydial infection. It is conceivable that an effective vaccine can be developed using physically or chemically inactivated Chlamydiae. However, such a vaccine does not have a high margin of safety. In general, safer vaccines are made by genetically manipulating the organism by attenuation or by recombinant means. Accordingly, a major obstacle in creating an effective and safe vaccine against human chlamydial infection has been the paucity of genetic information regarding Chlamydia, specifically C. pneumoniae.

Studies with *C. trachomatis* and *C. psittaci* indicate that safe and effective vaccine against Chlamydia is an

25 attainable goal. For example, mice which have recovered from a lung infection with *C. trachomatis* are protected from infertility induced by a subsequent vaginal challenge (Pal et al.(1996) Infection and Immunity.64:5341). Similarly, sheep immunized with inactivated *C. psittaci* were protected from

30 subsequent chlamydial-induced abortions and stillbirths (Jones et al. (1995) Vaccine 13:715). Protection from chlamydial infections has been associated with Th1 immune responses, particularly the induction of INFg - producing CD4+T-cells (Igietsemes et al. (1993) Immunology 5:317). The adoptive

transfer of CD4+ cell lines or clones to nude or SCID mice conferred protection from challenge or cleared chronic disease (Igietseme et al (1993) Regional Immunology 5:317; Magee et al (1993) Regional Immunology 5: 305), and in vivo depletion of 5 CD4+ T cells exacerbated disease post-challenge (Landers et al (1991) Infection & Immunity 59:3774; Magee et al (1995) Infection & Immunity 63:516). However, the presence of sufficiently high titres of neutralising antibody at mucosal surfaces can also exert a protective effect (Cotter et al. 10 (1995) Infection and Immunity 63:4704).

Antigenic variation within the species C. pneumoniae is not well documented due to insufficient genetic information, though variation is expected to exist based on C. trachomatis. Serovars of C. trachomatis are defined on the basis of antigenic 15 variation in MOMP, but published C. pneumoniae MOMP gene sequences show no variation between several diverse isolates of the organism (Campbell et al (1990) Infection and Immunity 58:93; McCafferty et al (1995) Infection and Immunity 63:2387-9; Knudsen et al (1996) Third Meeting of the European Society for 20 Chlamydia Research, Vienna). Regions of the protein known to be conserved in other chlamydial MOMPs are conserved in C. pneumoniae (Campbell et al (1990) Infection and Immunity 58:93; McCafferty et al (1995) Infection and Immunity 63:2387-9). One study has described a strain of C. pneumoniae with a MOMP of 25 greater that usual molecular weight, but the gene for this has not been sequenced (Grayston et al. (1995) Journal of Infectious Diseases 168:1231). Partial sequences of outer membrane protein 2 from nine diverse isolates were also found to be invariant (Ramirez et al (1996) Annals of Internal Medicine 125:979). 30 genes for HSP60 and HSP70 show little variation from other chlamydial species, as would be expected. The gene encoding a 76kDa antigen has been cloned from a single strain of C. pneumoniae. It has no significant similarity with other known

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chlamydial genes (Marrie (1993) Clinical Infectious Diseases. 18:501).

Many antigens recognised by immune sera to C.

pneumoniae are conserved across all Chlamydiae, but 98kDa,

76kDa and 54kDa proteins appear to be C. pneumoniae-specific
(Campos et al. (1995) Investigation of Ophthalmology and Visual
Science 36:1477; Marrie (1993) Clinical Infectious Diseases.

18:501; Wiedmann-Al-Ahmad M, et al. Reactions of polyclonal and
neutralizing anti-p54 monoclonal antibodies with an isolated,
species-specific 54-kilodalton protein of Chlamydia pneumoniae.
Clin Diagn Lab Immunol. 1997 Nov; 4(6): 700-704). A
publication relevant to 98KDa proteins is Perez Melgosa et al.
FEMS Microbiology Letters. 112(2): 199-204. 1993.

Immunoblotting of isolates with sera from patients
does show variation of blotting patterns between isolates,
indicating that serotypes C. pneumoniae may exist (Ref 1,16).
However, the results are potentially confounded by the
infection status of the patients, since immunoblot profiles of
a patient's sera change with time post-infection. An
assessment of the number and relative frequency of any
serotypes, and the defining antigens, is not yet possible.

Accordingly, a need exists for identifying and isolating polynucleotide sequences of *C. pneumoniae* for use in preventing and treating Chlamydia infection.

25 SUMMARY OF THE INVENTION

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The present invention provides purified and isolated polynucleotide molecules that encode Chlamydia polypeptides which can be used in methods to prevent, treat, and diagnose Chlamydia infection. In one form of the invention, the polynucleotide molecules are selected from DNA that encode polypeptides CPN100397 (SEQ ID Nos: 1 and 2), CPN100421 (SEQ ID

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Nos: 3 and 4), CPN100422 (SEQ ID Nos: 5 and 6), CPN100424 (SEQ ID Nos: 7 and 8), CPN100426 (SEQ ID Nos: 9 and 10), CPN100508 (SEQ ID Nos: 11 and 12), CPN100515 (SEQ ID Nos: 13 and 14), CPN100538 (SEQ ID Nos: 15 and 16), CPN100557 (SEQ ID Nos: 17 and

18), CPN100622 (SEQ ID Nos: 19 and 20), CPN100626 (SEQ ID Nos: 21 and, 22), CPN100628 (SEQ ID Nos: 23 and 24) and CPN100630 (SEQ ID Nos: 25 and 26).

Another form of the invention provides polypeptides

5 corresponding to the isolated DNA molecules. The amino acid sequences of the corresponding encoded polypeptides are shown for CPN100397 as SEQ ID Nos: 27 and 28, CPN100421 as SEQ ID No: 29, CPN100422 as SEQ ID No: 30, CPN100424 as SEQ ID No: 31, CPN100426 as SEQ ID No: 32, CPN100508 as SEQ ID Nos: 33 and 34, 10 CPN100515 as SEQ ID Nos: 35 and 36, CPN100538 as SEQ ID No: 37, CPN100557 as SEQ ID Nos: 38 and 39, CPN100622 as SEQ ID Nos: 40 and 41, CPN100626 as SEQ ID No: 42, CPN100628 as SEQ ID No: 43 and CPN100630 as SEQ ID Nos: 44 and 45.

Those skilled in the art will readily understand that the invention, having provided the polynucleotide sequences encoding Chlamydia polypeptides, also provides polynucleotides encoding fragments derived from such peptides. Moreover, the invention is understood to provide mutants and derivatives of such polypeptides and fragments derived therefrom, which result from the addition, deletion, or substitution of non-essential amino acids as described herein. Those skilled in the art would also readily understand that the invention, having provided the polynucleotide sequences encoding Chlamydia polypeptides, further provides monospecific antibodies that specifically bind to such polypeptides

The present invention has wide application and includes expression cassettes, vectors, and cells transformed or transfected with the polynucleotides of the invention.

Accordingly, the present invention further provides (i) a method 30 for producing a polypeptide of the invention in a recombinant host system and related expression cassettes, vectors, and transformed or transfected cells; (ii) a vaccine, or a live vaccine vector such as a pox virus, Salmonella typhimurium, or Vibrio cholerae vector, containing a polynucleotide of the

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invention, such vaccines and vaccine vectors being useful for, e.g., preventing and treating Chlamydia infection, in combination with a diluent or carrier, and related pharmaceutical compositions and associated therapeutic and/or prophylactic methods; (iii) a therapeutic and/or prophylactic use of an RNA or DNA molecule of the invention, either in a naked form or formulated with a delivery vehicle, a polypeptide or combination of polypeptides, or a monospecific antibody of the invention, and related pharmaceutical compositions; (iv) a method for diagnosing the presence of Chlamydia in a biological sample, which can involve the use of a DNA or RNA molecule, a monospecific antibody, or a polypeptide of the invention; and (v) a method for purifying a polypeptide of the invention by antibody-based affinity chromatography.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further understood from the following description with reference to the drawings, in which:

Figure 1 shows the nucleotide sequence of the CPN100397
20 (SEQ ID No: 1 - entire sequence and SEQ ID No: 2 - coding sequence) and the deduced amino acid sequence of the CPN100397 protein from Chlamydia pneumoniae (SEQ ID No: 27 and 28).

Figure 2 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100397 gene.

25 Figure 3 shows the nucleotide sequence of the CPN100421 (SEQ ID No: 3 - entire sequence and SEQ ID No: 4 - coding sequence) and the deduced amino acid sequence of the CPN100421 protein from Chlamydia pneumoniae (SEQ ID No: 29).

Figure 4 shows the restriction enzyme analysis of the 30 gene encoding the *C. pneumoniae* CPN100421 gene.

Figure 5 shows the nucleotide sequence of the CPN100422 (SEQ ID No: 5 - entire sequence and SEQ ID No: 6 - coding sequence) and the deduced amino acid sequence of the CPN100422 protein from Chlamydia pneumoniae (SEQ ID No: 30).

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Figure 6 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100422 gene.

Figure 7 shows the nucleotide sequence of the CPN100424 (SEQ ID No: 7 - entire sequence and SEQ ID No: 8 - coding 5 sequence) and the deduced amino acid sequence of the CPN100424 protein from Chlamydia pneumoniae (SEQ ID No: 31).

Figure 8 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100424 gene.

Figure 9 shows the nucleotide sequence of the CPN100426 10 (SEQ ID No: 9 - entire sequence and SEQ ID No: 10 - coding sequence) and the deduced amino acid sequence of the CPN100426 protein from Chlamydia pneumoniae (SEQ ID No: 32).

Figure 10 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100426 gene.

15 Figure 11 shows the nucleotide sequence of the CPN100508 (SEQ ID No: 11 - entire sequence and SEQ ID No: 12 - coding sequence) and the deduced amino acid sequence of the CPN100508protein from Chlamydia pneumoniae (SEQ ID No: 33 - full length sequence and SEQ ID No: 34 - processed sequence).

20 Figure 12 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100508 gene.

Figure 13 shows the nucleotide sequence of the CPN100515 (SEQ ID No: 13 - entire sequence and SEQ ID No: 14 - coding sequence) and the deduced amino acid sequence of the CPN100515 protein from Chlamydia pneumoniae (SEQ ID No: 35 - full length sequence and SEQ ID No: 36 - processed sequence).

Figure 14 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100515 gene.

Figure 15 shows the nucleotide sequence of the CPN100538 30 (SEQ ID No: 15 - entire sequence and SEQ ID No: 16 - coding sequence) and the deduced amino acid sequence of the CPN100538 protein from Chlamydia pneumoniae (SEQ ID No: 37).

Figure 16 shows the restriction enzyme analysis of the gene encoding the $C.\ pneumoniae\ CPN100538$ gene.

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Figure 17 shows the nucleotide sequence of the CPN100557 (SEQ ID No: 17 - entire sequence and SEQ ID No: 18 - coding sequence) and the deduced amino acid sequence of the CPN100557 protein from *Chlamydia pneumoniae* (SEQ ID No: 38 - full length 5 sequence and SEQ ID No: 39 - processed sequence).

Figure 18 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100557 gene.

Figure 19 shows the nucleotide sequence of the CPN100622 (SEQ ID No: 19 - entire sequence and SEQ ID No: 20 - coding 10 sequence) and the deduced amino acid sequence of the CPN100622 protein from Chlamydia pneumoniae (SEQ ID No: 40 - full length sequence and SEQ ID No: 41 - processed sequence).

Figure 20 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100622 gene.

15 Figure 21 shows the nucleotide sequence of the CPN100626 (SEQ ID No: 21 - entire sequence and SEQ ID No: 22 - coding sequence) and the deduced amino acid sequence of the CPN100626 protein from Chlamydia pneumoniae (SEQ ID No: 42).

Figure 22 shows the restriction enzyme analysis of the 20 gene encoding the *C. pneumoniae* CPN100626 gene.

Figure 23 shows the nucleotide sequence of the CPN100628 (SEQ ID No: 23 - entire sequence and SEQ ID No: 24 - coding sequence) and the deduced amino acid sequence of the CPN100628 protein from Chlamydia pneumoniae (SEQ ID No: 43).

25 Figure 24 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100628 gene.

Figure 25 shows the nucleotide sequence of the CPN100630 (SEQ ID No: 25 - entire sequence and SEQ ID No: 26 - coding sequence) and the deduced amino acid sequence of the CPN100630 protein from Chlamydia pneumoniae (SEQ ID No: 44 - full length sequence and SEQ ID No: 45 - processed sequence).

Figure 26 shows the restriction enzyme analysis of the gene encoding the *C. pneumoniae* CPN100630 gene.

Figures 27 through 39 show an identification of T and B cell epitopes from the amino acid sequences shown in the foregoing figures.

5 DETAILED DESCRIPTION OF INVENTION

Open reading frames (ORFs) encoding chlamydial polypeptides have been identified from the *C. pneumoniae* genome. These polypeptides include polypeptides found permanently in the bacterial membrane structure, polypeptides present in the external vicinity of the bacterial membrane, polypeptides found permanently in the inclusion membrane structure, polypeptides present in the external vicinity of the inclusion membrane, and polypeptides released into the cytoplasm of the infected cell. These polypeptides can be used to prevent and treat *Chlamydia* infection.

According to a first aspect of the invention, isolated polynucleotides are provided which encode the precursor and mature forms of *Chlamydia* polypeptides, whose amino acid sequences are selected from the group consisting of: SEQ ID 20 Nos: 27 to 45.

The term "isolated polynucleotide" is defined as a polynucleotide removed from the environment in which it naturally occurs. For example, a naturally-occurring DNA molecule present in the genome of a living bacteria or as part of a gene bank is not isolated, but the same molecule separated from the remaining part of the bacterial genome, as a result of, e.g., a cloning event (amplification), is isolated. Typically, an isolated DNA molecule is free from DNA regions (e.g., coding regions) with which it is immediately contiguous at the 5' or 3' ond, in the naturally occurring genome. Such isolated polynucleotides may be part of a vector or a composition and still be defined as isolated in that such a vector or composition is not part of the natural environment of such polynucleotide.

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The polynucleotide of the invention is either RNA or DNA (cDNA, genomic DNA, or synthetic DNA), or modifications, variants, homologs or fragments thereof. The DNA is either double-stranded or single-stranded, and, if single-stranded, is 5 either the coding strand or the non-coding (anti-sense) strand. Any one of the sequences that encode the polypeptides of the invention as shown in SEQ ID Nos: 1 to 26 is (a) a coding sequence, (b) a ribonucleotide sequence derived from transcription of (a), or (c) a coding sequence which uses the 10 redundancy or degeneracy of the genetic code to encode the same polypeptides. By "polypeptide" or "protein" is meant any chain of amino acids, regardless of length or post-translational modification (e.g., glycosylation or phosphorylation). Both terms are used interchangeably in the present application.

Consistent with the first aspect of the invention, amino 15 acid sequences are provided which are homologous to any one of SEQ ID Nos: 27 to 45. As used herein, "homologous amino acid sequence" is any polypeptide which is encoded, in whole or in part, by a nucleic acid sequence which hybridizes at 25-35°C 20 below critical melting temperature (Tm), to any portion of the nucleic acid sequences of SEQ ID Nos: 1 to 26. A homologous amino acid sequence is one that differs from an amino acid sequence shown in any one of SEQ ID Nos: 27 to 45 by one or more amino acid substitutions. Such a sequence also encompass 25 serotypic variants (defined below) as well as sequences containing deletions or insertions which retain inherent characteristics of the polypeptide such as immunogenicity. Preferably, such a sequence is at least 75%, more preferably 80%, and most preferably 90% identical to any one of SEQ ID Homologous amino acid sequences include 30 Nos: 27 to 45. sequences that are identical or substantially identical to SEQ ID Nos: 27 to 45. By "amino acid sequence substantially identical" is meant a sequence that is at least 90%, preferably

95%, more preferably 97%, and most preferably 99% identical to

an amino acid sequence of reference and that preferably differs from the sequence of reference by a majority of conservative amino acid substitutions.

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Conservative amino acid substitutions are substitutions

5 among amino acids of the same class. These classes include, for
example, amino acids having uncharged polar side chains, such as
asparagine, glutamine, serine, threonine, and tyrosine; amino
acids having basic side chains, such as lysine, arginine, and
histidine; amino acids having acidic side chains, such as

10 aspartic acid and glutamic acid; and amino acids having nonpolar
side chains, such as glycine, alanine, valine, leucine,
isoleucine, proline, phenylalanine, methionine, tryptophan, and
cysteine.

Homology is measured using sequence analysis software

15 such as Sequence Analysis Software Package of the Genetics

Computer Group, University of Wisconsin Biotechnology Center,

1710 University Avenue, Madison, WI 53705. Amino acid sequences

are aligned to maximize identity. Gaps may be artificially

introduced into the sequence to attain proper alignment. Once

20 the optimal alignment has been set up, the degree of homology is

established by recording all of the positions in which the amino

acids of both sequences are identical, relative to the total

number of positions.

Homologous polynucleotide sequences are defined in a 25 similar way. Preferably, a homologous sequence is one that is at least 45%, more preferably 60%, and most preferably 85% identical to any one of coding sequences SEQ ID Nos: 1 to 26.

Consistent with the first aspect of the invention, polypeptides having a sequence homologous to any one of SEQ ID 30 Nos: 27 to 45 include naturally-occurring allelic variants, as well as mutants or any other non-naturally occurring variants that retain the inherent characteristics of the polypeptide of SEQ ID Nos: 27 to 45.

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As is known in the art, an allelic variant is an alternate form of a polypeptide that is characterized as having a substitution, deletion, or addition of one or more amino acids that does not alter the biological function of the polypeptide.

5 By "biological function" is meant the function of the polypeptide in the cells in which it naturally occurs, even if the function is not necessary for the growth or survival of the cells. For example, the biological function of a porin is to allow the entry into cells of compounds present in the

10 extracellular medium. Biological function is distinct from antigenic property. A polypeptide can have more than one biological function.

Allelic variants are very common in nature. For example, a bacterial species such as *C. pneumoniae*, is usually

15 represented by a variety of strains that differ from each other by minor allelic variations. Indeed, a polypeptide that fulfills the same biological function in different strains can have an amino acid sequence (and polynucleotide sequence) that are not identical in each of the strains. Despite this

20 variation, an immune response directed generally against many allelic variants has been demonstrated. In studies of the *Chlamydial* MOMP antigen, cross-strain antibody binding plus neutralization of infectivity occurs despite amino acid sequence variation of MOMP from strain to strain, indicating that the

25 MOMP, when used as an immunogen, is tolerant of amino acid variations.

Polynucleotides encoding homologous polypeptides or allelic variants are retrieved by polymerase chain reaction (PCR) amplification of genomic bacterial DNA extracted by 30 conventional methods. This involves the use of synthetic oligonucleotide primers matching upstream and downstream of the 5' and 3' ends of the encoding domain. Suitable primers are designed according to the nucleotide sequence information provided in SEQ ID Nos:1 to 26. The procedure is as follows: a

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primer is selected which consists of 10 to 40, preferably 15 to 25 nucleotides. It is advantageous to select primers containing C and G nucleotides in a proportion sufficient to ensure efficient hybridization; i.e., an amount of C and G nucleotides 5 of at least 40%, preferably 50% of the total nucleotide content.

An alternative method for retrieving polynucleotides encoding homologous polypeptides or allelic variants is by hybridization screening of a DNA or RNA library. Hybridization procedures are well-known in the art and are described in

- 10 Ausubel et al., (Ref 41), Silhavy et al. (Ref 43), and Davis et al. (ref 44). Important parameters for optimizing hybridization conditions are reflected in a formula used to obtain the critical melting temperature above which two complementary DNA strands separate from each other (Ref 45). For polynucleotides
- of about 600 nucleotides or larger, this formula is as follows: $Tm = 81.5 + 0.5 \times (\% \text{ G+C}) + 1.6 \log \text{ (positive ion concentration)} 0.6 \times (\% \text{ formamide}). Under appropriate stringency conditions, hybridization temperature (Th) is approximately 20 to 40°C, 20 to 25°C, or, preferably 30 to 40°C below the calculated Tm.$
- 20 Those skilled in the art will understand that optimal temperature and salt conditions can be readily determined.

For the polynucleotides of the invention, stringent conditions are achieved for both pre-hybridizing and hybridizing incubations (i) within 4-16 hours at 42° C, in $6 \times SSC$ containing

25 50% formamide, or (ii) within 4-16 hours at 65° C in an aqueous 6 x SSC solution (1 M NaCl, 0.1 M sodium citrate (pH 7.0)).

Useful homologs and fragments thereof that do not occur naturally are designed using known methods for identifying regions of an antigen that are likely to tolerate amino acid 30 sequence changes and/or deletions. As an example, homologous polypeptides from different species are compared; conserved sequences are identified. The more divergent sequences are the most likely to tolerate sequence changes. Alternatively, sequences are modified such that they become more reactive to T-

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and/or B-cells. (See Table below for identification of T- and B- epitopes.) Yet another alternative is to mutate a particular amino acid residue or sequence within the polypeptide in vitro, then screen the mutant polypeptides for their ability to prevent or treat Chlamydia infection according to the method outlined below.

A person skilled in the art will readily understand that by following the screening process of this invention, it will be determined without undue experimentation whether a particular 10 homolog of any of SEQ ID Nos: 27 to 45 may be useful in the prevention or treatment of Chlamydia infection. The screening procedure comprises the steps:

- (i) immunizing an animal, preferably mouse, with the test homolog or fragment;
- 15 (ii) inoculating the immunized animal with Chlamydia; and
 - (iii) selecting those homologs or fragments which confer protection against Chlamydia.

By "conferring protection" is meant that there is a 20 reduction is severity of any of the effects of Chlamydia infection, in comparison with a control animal which was not immunized with the test homolog or fragment.

It has been previously demonstrated (Yang et. al., 1993) that mice are susceptible to intranasal infection with different 25 isolates of *C. pneumoniae*. Strain AR-39 (Grayston, 1989) was used in Balb/c mice as a challenge infection model to examine the capacity of chlamydia gene products delivered as naked DNA to elicit a protective response against a sublethal *C. pneumoniae* lung infection. Protective immunity is defined as an accelerated clearance of pulmonary infection.

Groups of 7 to 9 week old male Balb/c mice (6 to 10 per group) were immunized intramuscularly (i.m.) plus intranasally (i.n.) with plasmid DNA containing the coding sequence of a *C.pneumoniae* polypeptide. Saline or the plasmid vector lacking

an inserted chlamydial gene was given to groups of control animals.

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For i.m. immunization alternate left and right quadriceps were injected with 100µg of DNA in 50µl of PBS on 5 three occasions at 0, 3 and 6 weeks. For i.n. immunization, anaesthetized mice aspirated 50µl of PBS containing 50 µg DNA on three occasions at 0, 3 and 6 weeks. At week 8, immunized mice were inoculated i.n. with 5 x 10⁵ IFU of *C. pneumoniae*, strain AR39 in 100µl of SPG buffer to test their ability to limit the 10 growth of a sublethal *C. pneumoniae* challenge.

Lungs were taken from mice at day 9 post-challenge and immediately homogenised in SPG buffer (7.5% sucrose, 5mM glutamate, 12.5mM phosphate pH7.5). The homogenate was stored frozen at -70°C until assay. Dilutions of the homogenate were 15 assayed for the presence of infectious chlamydia by inoculation onto monolayers of susceptible cells. The inoculum was centrifuged onto the cells at 3000rpm for 1 hour, then the cells were incubated for three days at 35°C in the presence of 1µg/ml cycloheximide. After incubation the monolayers were fixed with 20 formalin and methanol then immunoperoxidase stained for the presence of chlamydial inclusions using convalescent sera from rabbits infected with C.pneumoniae and metal-enhanced DAB as a peroxidase substrate.

Consistent with the first aspect of the invention,
25 polypeptide derivatives are provided that are partial sequences
of SEQ ID Nos: 27 to 45, partial sequences of polypeptide
sequences homologous to SEQ ID Nos: 27 to 45, polypeptides
derived from full-length polypeptides by internal deletion, and
fusion proteins.

It is an accepted practice in the field of immunology to use fragments and variants of protein immunogens as vaccines, as all that is required to induce an immune response to a protein is a small (e.g., 8 to 10 amino acid) immunogenic region of the

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protein. Various short synthetic peptides corresponding to surface-exposed antigens of pathogens other than *Chlamydia* have been shown to be effective vaccine antigens against their respective pathogens, e.g. an 11 residue peptide of murine 5 mammary tumor virus (Ref 38), a 16-residue peptide of Semliki Forest virus (Ref 39), and two overlapping peptides of 15 residues each from canine parvovirus (Ref 40).

Accordingly, it will be readily apparent to one skilled in the art, having read the present description, that partial 10 sequences of SEQ ID Nos: 27 to 45 or their homologous amino acid sequences are inherent to the full-length sequences and are taught by the present invention. Such polypeptide fragments preferably are at least 12 amino acids in length. Advantageously, they are at least 20 amino acids, preferably at least 50 amino acids, more preferably at least 75 amino acids, and most preferably at least 100 amino acids in length.

Polynucleotides of 30 to 600 nucleotides encoding partial sequences of sequences homologous to SEQ ID Nos: 27 to 45 are retrieved by PCR amplification using the parameters outlined 20 above and using primers matching the sequences upstream and downstream of the 5' and 3' ends of the fragment to be amplified. The template polynucleotide for such amplification is either the full length polynucleotide homologous to one of SEQ ID Nos: 1 to 26, or a polynucleotide contained in a mixture 25 of polynucleotides such as a DNA or RNA library. As an alternative method for retrieving the partial sequences, screening hybridization is carried out under conditions described above and using the formula for calculating Tm. fragments of 30 to 600 nucleotides are to be retrieved, the 30 calculated Tm is corrected by subtracting (600/polynucleotide size in base pairs) and the stringency conditions are defined by a hybridization temperature that is 5 to 10°C below Tm. Where oligonucleotides shorter than 20-30 bases are to be obtained, the formula for calculating the Tm is as follows: $Tm = 4 \times (G+C)$

+ 2 (A+T). For example, an 18 nucleotide fragment of 50% G+C would have an approximate Tm of 54°C. Short peptides that are fragments of SEQ. ID Nos. 27 to 45 or their homologous sequences, are obtained directly by chemical synthesis (E. Gross and H. J. Meinhofer, 4 The Peptides: Analysis, Synthesis, Biology; Modern Techniques of Peptide Synthesis, John Wiley & Sons (1981), and M. Bodanzki, Principles of Peptide Synthesis, Springer -Verlag (1984)).

Useful polypeptide derivatives, e.g., polypeptide 10 fragments, are designed using computer-assisted analysis of amino acid sequences. This identifies probable surfaceexposed, antigenic regions (Ref 37). An analysis of the 13 amino acid sequences contained in SEQ ID Nos: 27 to 45, based on the product of flexibility and hydrophobicity propensities using 15 the program SEQSEE (Wishart DS, et al. "SEQSEE: a comprehensive program suite for protein sequence analysis." Comput Appl Biosci. 1994 Apr; 10(2):121-32), reveal a number of potential Band T-cell epitopes which may be used as a basis for selecting useful immunogenic fragments and variants. The results are 20 shown in Figures 27 to 39. This analysis uses a reasonable combination of external surface features that is likely to be recognized by antibodies. Probable T-cell epitopes for HLA-A0201 MHC subclass were revealed by an algorithm written at Connaught Laboratories that emulates an approach developed at 25 the NIH (Parker KC, et al. "Peptide binding to MHC class I molecules: implications for antigenic peptide prediction."

Epitopes which induce a protective T cell-dependent immune response are present throughout the length of the 30 polypeptide. However, some epitopes may be masked by secondary and tertiary structures of the polypeptide. To reveal such masked epitopes large internal deletions are created which remove much of the original protein structure and exposes the masked epitopes. Such internal deletions sometimes effects the

Immunol Res 1995;14(1):34-57).

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additional advantage of removing immunodominant regions of high variability among strains. Polynucleotides encoding polypeptide fragments and polypeptides having large internal deletions are constructed using standard methods (Ref 41). Such methods include standard PCR, inverse PCR, restriction enzyme treatment of cloned DNA molecules, or the method of Kunkel et al. (Ref 42). Components for these methods and instructions for their use are readily available from various commercial sources such as Stratagene. Once the deletion mutants have been constructed, they are tested for their ability to prevent or treat Chlamydia infection as described above.

As used herein, a fusion polypeptide is one that contains a polypeptide or a polypeptide derivative of the invention fused at the N- or C-terminal end to any other polypeptide

- 15 (hereinafter referred to as a peptide tail). A simple way to obtain such a fusion polypeptide is by translation of an inframe fusion of the polynucleotide sequences, i.e., a hybrid gene. The hybrid gene encoding the fusion polypeptide is inserted into an expression vector which is used to transform or
- 20 transfect a host cell. Alternatively, the polynucleotide sequence encoding the polypeptide or polypeptide derivative is inserted into an expression vector in which the polynucleotide encoding the peptide tail is already present. Such vectors and instructions for their use are commercially available, e.g.
- 25 the pMal-c2 or pMal-p2 system from New England Biolabs, in which the peptide tail is a maltose binding protein, the glutathione-S-transferase system of Pharmacia, or the His-Tag system available from Novagen. These and other expression systems provide convenient means for further purification of polypeptides and derivatives of the invention.

An advantageous example of a fusion polypeptide is one where the polypeptide or homolog or fragment of the invention is fused to a polypeptide having adjuvant activity, such as subunit B of either cholera toxin or *E. coli* heat-labile toxin. Another

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advantageous fusion is one where the polypeptide, homolog or fragment is fused to a strong T-cell epitope or B-cell epitope. Such an epitope may be one known in the art (e.g. the Hepatitis B virus core antigen, D.R. Millich et al., "Antibody production 5 to the nucleocapsid and envelope of the Hepatitis B virus primed by a single synthetic T cell site", Nature. 1987. 329:547-549), or one which has been identified in another polypeptide of the invention (Table). Consistent with this aspect of the invention is a fusion polypeptide comprising T- or B-cell 10 epitopes from one of SEQ ID Nos: 27 to 45 or its homolog or fragment, wherein the epitopes are derived from multiple variants of said polypeptide or homolog or fragment, each variant differing from another in the location and sequence of its epitope within the polypeptide. Such a fusion is effective 15 in the prevention and treatment of Chlamydia infection since it optimizes the T- and B-cell response to the overall polypeptide, homolog or fragment.

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To effect fusion, the polypeptide of the invention is fused to the N-, or preferably, to the C-terminal end of the 20 polypeptide having adjuvant activity or T- or B-cell epitope. Alternatively, a polypeptide fragment of the invention is inserted internally within the amino acid sequence of the polypeptide having adjuvant activity. The T- or B-cell epitope may also be inserted internally within the amino acid sequence 25 of the polypeptide of the invention.

Consistent with the first aspect, the polynucleotides of the invention also encode hybrid precursor polypeptides containing heterologous signal peptides, which mature into polypeptides of the invention. By "heterologous signal peptide" 30 is meant a signal peptide that is not found in naturally-occurring precursors of polypeptides of the invention.

A polynucleotide molecule according to the invention, including RNA, DNA, or modifications or combinations thereof, have various applications. A DNA molecule is used, for example,

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(i) in a process for producing the encoded polypeptide in a recombinant host system, (ii) in the construction of vaccine vectors such as poxviruses, which are further used in methods and compositions for preventing and/or treating Chlamydia
5 infection, (iii) as a vaccine agent (as well as an RNA molecule), in a naked form or formulated with a delivery vehicle and, (iv) in the construction of attenuated Chlamydia strains that can over-express a polynucleotide of the invention or express it in a non-toxic, mutated form.

- Accordingly, a second aspect of the invention encompasses 10 (i) an expression cassette containing a DNA molecule of the invention placed under the control of the elements required for expression, in particular under the control of an appropriate promoter; (ii) an expression vector containing an expression 15 cassette of the invention; (iii) a procaryotic or eucaryotic cell transformed or transfected with an expression cassette and/or vector of the invention, as well as (iv) a process for producing a polypeptide or polypeptide derivative encoded by a polynucleotide of the invention, which involves culturing a 20 procaryotic or eucaryotic cell transformed or transfected with an expression cassette and/or vector of the invention, under conditions that allow expression of the DNA molecule of the invention and, recovering the encoded polypeptide or polypeptide derivative from the cell culture.
- A recombinant expression system is selected from procaryotic and eucaryotic hosts. Eucaryotic hosts include yeast cells (e.g., Saccharomyces cerevisiae or Pichia pastoris), mammalian cells (e.g., COS1, NIH3T3, or JEG3 cells), arthropods cells (e.g., Spodoptera frugiperda (SF9) cells), and plant cells. A preferred expression system is a procaryotic host such as E. coli. Bacterial and eucaryotic cells are available from a number of different sources including commercial sources to those skilled in the art, e.g., the American Type Culture Collection (ATCC; Rockville, Maryland). Commercial sources of

cells used for recombinant protein expression also provide instructions for usage of the cells.

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The choice of the expression system depends on the features desired for the expressed polypeptide. For example, it 5 may be useful to produce a polypeptide of the invention in a particular lipidated form or any other form.

One skilled in the art would redily understand that not all vectors and expression control sequences and hosts would be expected to express equally well the polynucleotides of this 10 invention. With the guidelines described below, however, a selection of vectors, expression control sequences and hosts may be made without undue experimentation and without departing from the scope of this invention.

In selecting a vector, the host must be chosen that is 15 compatible with the vector which is to exist and possibly replicate in it. Considerations are made with respect to the vector copy number, the ability to control the copy number, expression of other proteins such as antibiotic resistance. selecting an expression control sequence, a number of variables 20 are considered. Among the important variable are the relative strength of the sequence (e.g. the ability to drive expression under various conditions), the ability to control the sequence's function, compatibility between the polynucleotide to be expressed and the control sequence (e.g. secondary structures 25 are considered to avoid hairpin structures which prevent efficient transcription). In selecting the host, unicellular hosts are selected which are compatible with the selected vector, tolerant of any possible toxic effects of the expressed product, able to secrete the expressed product efficiently if 30 such is desired, to be able to express the product in the desired conformation, to be easily scaled up, and to which ease of purification of the final product.

The choice of the expression cassette depends on the host system selected as well as the features desired for the

26 expressed polypeptide. Typically, an expression cassette includes a promoter that is functional in the selected host system and can be constitutive or inducible; a ribosome binding site; a start codon (ATG) if necessary; a region encoding a 5 signal peptide, e.g., a lipidation signal peptide; a DNA molecule of the invention; a stop codon; and optionally a 3' terminal region (translation and/or transcription terminator). The signal peptide encoding region is adjacent to the polynucleotide of the invention and placed in proper reading 10 frame. The signal peptide-encoding region is homologous or heterologous to the DNA molecule encoding the mature polypeptide and is compatible with the secretion apparatus of the host used for expression. The open reading frame constituted by the DNA molecule of the invention, solely or together with the signal 15 peptide, is placed under the control of the promoter so that transcription and translation occur in the host system. Promoters and signal peptide encoding regions are widely known and available to those skilled in the art and include, for example, the promoter of Salmonella typhimurium (and 20 derivatives) that is inducible by arabinose (promoter araB) and is functional in Gram-negative bacteria such as E. coli (as described in U.S. Patent No. 5,028,530 and in Cagnon et al., (Ref 46)); the promoter of the gene of bacteriophage T7 encoding RNA polymerase, that is functional in a number of E. coli 25 strains expressing T7 polymerase (described in U.S. Patent No. 4,952,496); OspA lipidation signal peptide; and RlpB

The expression cassette is typically part of an expression vector, which is selected for its ability to 30 replicate in the chosen expression system. Expression vectors (e.g., plasmids or viral vectors) can be chosen, for example, from those described in Pouwels et al. (Cloning Vectors: A Laboratory Manual 1985, Supp. 1987). Suitable expression vectors can be purchased from various commercial sources.

lipidation signal peptide (Ref 47).

Methods for transforming/transfecting host cells with expression vectors are well-known in the art and depend on the host system selected as described in Ausubel et al., (Ref 41).

Upon expression, a recombinant polypeptide of the 5 invention (or a polypeptide derivative) is produced and remains in the intracellular compartment, is secreted/excreted in the extracellular medium or in the periplasmic space, or is embedded in the cellular membrane. The polypeptide is recovered in a substantially purified form from the cell extract or from the 10 supernatant after centrifugation of the recombinant cell culture. Typically, the recombinant polypeptide is purified by antibody-based affinity purification or by other well-known methods that can be readily adapted by a person skilled in the art, such as fusion of the polynucleotide encoding the

15 polypeptide or its derivative to a small affinity binding domain. Antibodies useful for purifying by immunoaffinity the polypeptides of the invention are obtained as described below.

A polynucleotide of the invention can also be useful as a vaccine. There are two major routes, either using a viral or 20 bacterial host as gene delivery vehicle (live vaccine vector) or administering the gene in a free form, e.g., inserted into a plasmid. Therapeutic or prophylactic efficacy of a polynucleotide of the invention is evaluated as described below.

Accordingly, a third aspect of the invention provides (i)
25 a vaccine vector such as a poxvirus, containing a DNA molecule
of the invention, placed under the control of elements required
for expression; (ii) a composition of matter comprising a
vaccine vector of the invention, together with a diluent or
carrier; specifically (iii) a pharmaceutical composition
30 containing a therapeutically or prophylactically effective
amount of a vaccine vector of the invention; (iv) a method for
inducing an immune response against Chlamydia in a mammal (e.g.,
a human; alternatively, the method can be used in veterinary
applications for treating or preventing Chlamydia infection of

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animals, e.g., cats or birds), which involves administering to the mammal an immunogenically effective amount of a vaccine vector of the invention to elicit a protective or therapeutic immune response to Chlamydia; and particularly, (v) a method 5 for preventing and/or treating a Chlamydia (e.g., C. trachomatis, C. psittaci, C. pneumonia, C. pecorum) infection, which involves administering a prophylactic or therapeutic amount of a vaccine vector of the invention to an infected individual. Additionally, the third aspect of the invention 10 encompasses the use of a vaccine vector of the invention in the preparation of a medicament for preventing and/or treating Chlamydia infection.

As used herein, a vaccine vector expresses one or several polypeptides or derivatives of the invention, as well as at 15 least one additional *Chlamydia* antigen (??), fragment, homolog, mutant, or derivative thereof. The vaccine vector may express additionally a cytokine, such as interleukin-2 (IL-2) or interleukin-12 (IL-12), that enhances the immune response (adjuvant effect). It is understood that each of the components 20 to be expressed is placed under the control of elements required for expression in a mammalian cell.

Consistent with the third aspect of the invention is a composition comprising several vaccine vectors, each of them capable of expressing a polypeptide or derivative of the 25 invention. A composition may also comprise a vaccine vector capable of expressing an additional *Chlamydia* antigen, or a subunit, fragment, homolog, mutant, or derivative thereof; or a cytokine such as IL-2 or IL-12.

Vaccination methods for treating or preventing infection 30 in a mammal comprises use of a vaccine vector of the invention to be administered by any conventional route, particularly to a mucosal (e.g., ocular, intranasal, oral, gastric, pulmonary, intestinal, rectal, vaginal, or urinary tract) surface or via the parenteral (e.g., subcutaneous, intradermal, intramuscular,

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intravenous, or intraperitoneal) route. Preferred routes depend upon the choice of the vaccine vector. Treatment may be effected in a single dose or repeated at intervals. The appropriate dosage depends on various parameters understood by skilled artisans such as the vaccine vector itself, the route of administration or the condition of the mammal to be vaccinated (weight, age and the like).

Live vaccine vectors available in the art include viral vectors such as adenoviruses and poxviruses as well as bacterial 10 vectors, e.g., Shigella, Salmonella, Vibrio cholerae, Lactobacillus, Bacille bilié de Calmette-Guérin (BCG), and Streptococcus.

An example of an adenovirus vector, as well as a method for constructing an adenovirus vector capable of expressing a 15 DNA molecule of the invention, are described in U.S. Patent No. 4,920,209. Poxvirus vectors include vaccinia and canary pox virus, described in U.S. Patent No. 4,722,848 and U.S. Patent No. 5,364,773, respectively. (Also see, e.g., Tartaglia et al., Virology (1992) 188:217) for a description of a vaccinia virus 20 vector and Taylor et al, Vaccine (1995) 13:539 for a reference of a canary pox.) Poxvirus vectors capable of expressing a polynucleotide of the invention are obtained by homologous recombination as described in Kieny et al., Nature (1984) 312:163 so that the polynucleotide of the invention is inserted 25 in the viral genome under appropriate conditions for expression in mammalian cells. Generally, the dose of vaccine viral vector, for therapeutic or prophylactic use, can be of from about 1×10^4 to about 1×10^{11} , advantageously from about 1×10^7 to about 1x10¹⁰, preferably of from about 1x10⁷ to about 1x10⁹ 30 plaque-forming units per kilogram. Preferably, viral vectors are administered parenterally; for example, in 3 doses, 4 weeks apart. It is preferable to avoid adding a chemical adjuvant to a composition containing a viral vector of the invention and

thereby minimizing the immune response to the viral vector itself.

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Non-toxicogenic Vibrio cholerae mutant strains that are useful as a live oral vaccine are known. Mekalanos et al., 5 Nature (1983) 306:551 and U.S. Patent No. 4,882,278 describe strains which have a substantial amount of the coding sequence of each of the two ctxA alleles deleted so that no functional cholerae toxin is produced. WO 92/11354 describes a strain in which the irgA locus is inactivated by mutation; this mutation 10 can be combined in a single strain with ctxA mutations. WO 94/1533 describes a deletion mutant lacking functional ctxA and attRS1 DNA sequences. These mutant strains are genetically engineered to express heterologous antigens, as described in WO 94/19482. An effective vaccine dose of a Vibrio cholerae 15 strain capable of expressing a polypeptide or polypeptide derivative encoded by a DNA molecule of the invention contains about $1x10^5$ to about $1x10^9$, preferably about $1x10^6$ to about $1x10^8$, viable bacteria in a volume appropriate for the selected route of administration. Preferred routes of administration include 20 all mucosal routes; most preferably, these vectors are administered intranasally or orally.

Attenuated Salmonella typhimurium strains, genetically engineered for recombinant expression of heterologous antigens or not, and their use as oral vaccines are described in 25 Nakayama et al. (Bio/Technology (1988) 6:693) and WO 92/11361. Preferred routes of administration include all mucosal routes; most preferably, these vectors are administered intranasally or

Other bacterial strains used as vaccine vectors in the 30 context of the present invention are described in High et al., EMBO (1992) 11:1991 and Sizemore et al., Science (1995) 270:299 (Shigella flexneri); Medaglini et al., Proc. Natl. Acad. Sci. USA (1995) 92:6868 (Streptococcus gordonii), Flynn J.L., Cell.

orally.

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Mol. Biol. (1994) 40 (suppl. I):31, WO 88/6626, WO 90/0594, WO 91/13157, WO 92/1796, and WO 92/21376 (Bacille Calmette Guerin).

In bacterial vectors, the polynucleotide of the invention is inserted into the bacterial genome or remains in a free 5 state as part of a plasmid.

The composition comprising a vaccine bacterial vector of the present invention may further contain an adjuvant . A number of adjuvants are known to those skilled in the art. Preferred adjuvants are selected from the list provided below.

- Accordingly, a fourth aspect of the invention provides

 (i) a composition of matter comprising a polynucleotide of the invention, together with a diluent or carrier; (ii) a pharmaceutical composition comprising a therapeutically or prophylactically effective amount of a polynucleotide of the
- 15 invention; (iii) a method for inducing an immune response against *Chlamydia* in a mammal by administration of an immunogenically effective amount of a polynucleotide of the invention to elicit a protective immune response to *Chlamydia*; and particularly, (iv) a method for preventing and/or treating a
- 20 Chlamydia (e.g., C. trachomatis, C. psittaci, C. pneumoniae, or C. pecorum) infection, by administering a prophylactic or therapeutic amount of a polynucleotide of the invention to an infected individual. Additionally, the fourth aspect of the invention encompasses the use of a polynucleotide of the
- 25 invention in the preparation of a medicament for preventing and/or treating *Chlamydia* infection. A preferred use includes the use of a DNA molecule placed under conditions for expression in a mammalian cell, especially in a plasmid that is unable to replicate in mammalian cells and to substantially integrate in a 30 mammalian genome.

Use of the polynucleotides of the invention include their administration to a mammal as a vaccine, for therapeutic or prophylactic purposes. Such polynucleotides are used in the form of DNA as part of a plasmid that is unable to replicate in

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a mammalian cell and unable to integrate into the mammalian genome. Typically, such a DNA molecule is placed under the control of a promoter suitable for expression in a mammalian cell. The promoter functions either ubiquitously or tissue5 specifically. Examples of non-tissue specific promoters include the early Cytomegalovirus (CMV) promoter (described in U.S. Patent No. 4,168,062) and the Rous Sarcoma Virus promoter (described in Norton & Coffin, Molec. Cell Biol. (1985) 5:281). An example of a tissue-specific promoter is the desmin promoter which drives expression in muscle cells (Li et al., Gene (1989) 78:243, Li & Paulin, J. Biol. Chem. (1991) 266:6562 and Li & Paulin, J. Biol. Chem. (1993) 268:10403). Use of promoters is well-known to those skilled in the art. Useful vectors are described in numerous publications, specifically WO 94/21797 and 15 Hartikka et al., Human Gene Therapy (1996) 7:1205.

Polynucleotides of the invention which are used as a vaccine encode either a precursor or a mature form of the corresponding polypeptide. In the precursor form, the signal peptide is either homologous or heterologous. In the latter 20 case, a eucaryotic leader sequence such as the leader sequence of the tissue-type plasminogen factor (tPA) is preferred.

As used herein, a composition of the invention contains one or several polynucleotides with optionally at least one additional polynucleotide encoding another *Chlamydia* antigen

25 such as urease subunit A, B, or both, or a fragment, derivative, mutant, or analog thereof. The composition may also contain an additional polynucleotide encoding a cytokine, such as interleukin-2 (IL-2) or interleukin-12 (IL-12) so that the immune response is enhanced. These additional polynucleotides

30 are placed under appropriate control for expression.

Advantageously, DNA molecules of the invention and/or additional DNA molecules to be included in the same composition, are present in the same plasmid.

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Standard techniques of molecular biology for preparing and purifying polynucleotides are used in the preparation of polynucleotide therapeutics of the invention. For use as a vaccine, a polynucleotide of the invention is formulated 5 according to various methods outlined below.

One method utililizes the polynucleotide in a naked form, free of any delivery vehicles. Such a polynucleotide is simply diluted in a physiologically acceptable solution such as sterile saline or sterile buffered saline, with or without a carrier. When present, the carrier preferably is isotonic, hypotonic, or weakly hypertonic, and has a relatively low ionic strength, such as provided by a sucrose solution, e.g., a solution containing 20% sucrose.

An alternative method utilizes the polynucleotide in

15 association with agents that assist in cellular uptake.

Examples of such agents are (i) chemicals that modify cellular permeability, such as bupivacaine (see, e.g., WO 94/16737), (ii) liposomes for encapsulation of the polynucleotide, or (iii) cationic lipids or silica, gold, or tungsten

20 microparticles which associate themselves with the polynucleotides.

Anionic and neutral liposomes are well-known in the art (see, e.g., Liposomes: A Practical Approach, RPC New Ed, IRL press (1990), for a detailed description of methods for making 25 liposomes) and are useful for delivering a large range of products, including polynucleotides. Cationic lipids are also known in the art and are commonly used for gene delivery. Such lipids include LipofectinTM also known as DOTMA (N-[1-(2,3-dioleyloxy)propyl]-N,N,N-trimethylammonium chloride), DOTAP 30 (1,2-bis(oleyloxy)-3-(trimethylammonio)propane), DDAB (dimethyldioctadecylammonium bromide), DOGS (dioctadecylamidologlycyl spermine) and cholesterol derivatives such as DC-Chol (3 beta-(N-(N',N'-dimethyl aminomethane)-carbamoyl) cholesterol). A description of these cationic lipids

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can be found in EP 187,702, WO 90/11092, U.S. Patent No. 5,283,185, WO 91/15501, WO 95/26356, and U.S. Patent No. 5,527,928. Cationic lipids for gene delivery are preferably used in association with a neutral lipid such as DOPE (dioleyl phosphatidylethanolamine), as described in WO 90/11092 as an example.

Formulation containing cationic liposomes may optionally contain other transfection-facilitating compounds. A number of them are described in WO 93/18759, WO 93/19768, WO 94/25608, and 10 WO 95/2397. They include spermine derivatives useful for facilitating the transport of DNA through the nuclear membrane (see, for example, WO 93/18759) and membrane-permeabilizing compounds such as GALA, Gramicidine S, and cationic bile salts (see, for example, WO 93/19768).

Gold or tungsten microparticles are used for gene delivery, as described in WO 91/359, WO 93/17706, and Tang et al. (Nature (1992) 356:152). The microparticle-coated polynucleotide is injected via intradermal or intraepidermal routes using a needleless injection device ("gene gun"), such as those described in U.S. Patent No. 4,945,050, U.S. Patent No. 5,015,580, and WO 94/24263.

The amount of DNA to be used in a vaccine recipient depends, e.g., on the strength of the promoter used in the DNA construct, the immunogenicity of the expressed gene product, the 25 condition of the mammal intended for administration (e.g., the weight, age, and general health of the mammal), the mode of administration, and the type of formulation. In general, a therapeutically or prophylactically effective dose from about 1 µg to about 1 mg, preferably, from about 10 µg to about 800 µg 30 and, more preferably, from about 25 µg to about 250 µg, can be administered to human adults. The administration can be achieved in a single dose or repeated at intervals.

The route of administration is any conventional route used in the vaccine field. As general guidance, a

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polynucleotide of the invention is administered *via* a mucosal surface, *e.g.*, an ocular, intranasal, pulmonary, oral, intestinal, rectal, vaginal, and urinary tract surface; or *via* a parenteral route, *e.g.*, by an intravenous, subcutaneous,

- 5 intraperitoneal, intradermal, intraepidermal, or intramuscular route. The choice of administration route depends on the formulation that is selected. A polynucleotide formulated in association with bupivacaine is advantageously administered into muscles. When a neutral or anionic liposome or a cationic
- 10 lipid, such as DOTMA or DC-Chol, is used, the formulation can be advantageously injected *via* intravenous, intranasal (aerosolization), intramuscular, intradermal, and subcutaneous routes. A polynucleotide in a naked form can advantageously be administered *via* the intramuscular, intradermal, or sub-

Although not absolutely required, such a composition can also contain an adjuvant. If so, a systemic adjuvant that does not require concomitant administration in order to exhibit an adjuvant effect is preferable such as, e.g., QS21, which is 20 described in U.S. Patent No. 5,057,546.

The sequence information provided in the present application enables the design of specific nucleotide probes and primers that are used for diagnostic purposes. Accordingly, a fifth aspect of the invention provides a nucleotide probe or 25 primer having a sequence found in or derived by degeneracy of the genetic code from a sequence shown in any one of SEQ ID Nos:1 to 26.

The term "probe" as used in the present application refers to DNA (preferably single stranded) or RNA molecules (or 30 modifications or combinations thereof) that hybridize under the stringent conditions, as defined above, to nucleic acid molecules having SEQ ID Nos: 1 to 26 or to sequences homologous to SEQ ID Nos:1 to 26, or to their complementary or anti-sense sequences. Generally, probes are significantly shorter than

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full-length sequences . Such probes contain from about 5 to about 100, preferably from about 10 to about 80, nucleotides. In particular, probes have sequences that are at least 75%, preferably at least 85%, more preferably 95% homologous to a 5 portion of any of SEQ ID Nos:1 to 26 or that are complementary to such sequences. Probes may contain modified bases such as inosine, methyl-5-deoxycytidine, deoxyuridine, dimethylamino-5-deoxyuridine, or diamino-2, 6-purine. Sugar or phosphate residues may also be modified or substituted. For example, a 10 deoxyribose residue may be replaced by a polyamide (Nielsen et al., Science (1991) 254:1497) and phosphate residues may be replaced by ester groups such as diphosphate, alkyl, arylphosphonate and phosphorothicate esters. In addition, the 2'-hydroxyl group on ribonucleotides may be modified by 15 including such groups as alkyl groups.

Probes of the invention are used in diagnostic tests, as capture or detection probes. Such capture probes are conventionally immobilized on a solid support, directly or indirectly, by covalent means or by passive adsorption. A 20 detection probe is labelled by a detection marker selected from: radioactive isotopes, enzymes such as peroxidase, alkaline phosphatase, and enzymes able to hydrolyze a chromogenic, fluorogenic, or luminescent substrate, compounds that are chromogenic, fluorogenic, or luminescent, nucleotide base 25 analogs, and biotin.

Probes of the invention are used in any conventional hybridization technique, such as dot blot (Maniatis et al., Molecular Cloning: A Laboratory Manual (1982) Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York), Southern blot (Southern, J. Mol. Biol. (1975) 98:503), northern blot (identical to Southern blot with the exception that RNA is used as a target), or the sandwich technique (Dunn et al., Cell (1977) 12:23). The latter technique involves the use of a specific capture probe and/or a specific detection probe with

nucleotide sequences that at least partially differ from each other.

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A primer is a probe of usually about 10 to about 40 nucleotides that is used to initiate enzymatic polymerization 5 of DNA in an amplification process (e.g., PCR), in an elongation process, or in a reverse transcription method. Primers used in diagnostic methods involving PCR are labeled by methods known in the art.

As described herein, the invention also encompasses (i) a 10 reagent comprising a probe of the invention for detecting and/or identifying the presence of Chlamydia in a biological material; (ii) a method for detecting and/or identifying the presence of Chlamydia in a biological material, in which (a) a sample is recovered or derived from the biological material, (b) DNA or 15 RNA is extracted from the material and denatured, and (c) exposed to a probe of the invention, for example, a capture, detection probe or both, under stringent hybridization conditions, such that hybridization is detected; and (iii) a method for detecting and/or identifying the presence of 20 Chlamydia in a biological material, in which (a) a sample is recovered or derived from the biological material, (b) DNA is extracted therefrom, (c) the extracted DNA is primed with at least one, and preferably two, primers of the invention and amplified by polymerase chain reaction, and (d) the amplified 25 DNA fragment is produced.

It is apparent that disclosure of polynucleotide sequences of SEQ ID Nos: 1 to 26, their homolog, and partial sequences of either enable their corresponding amino acid sequences. Accordingly, a sixth aspect of the invention 30 features a substantially purified polypeptide or polypeptide derivative having an amino acid sequence encoded by a polynucleotide of the invention.

A "substantially purified polypeptide" as used herein is defined as a polypeptide that is separated from the environment

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in which it naturally occurs and/or that is free of the majority of the polypeptides that are present in the environment in which it was synthesized. For example, a substantially purified polypeptide is free from cytoplasmic polypeptides. Those skilled in the art would readily understand that the polypeptides of the invention may be purified from a natural source, i.e., a Chlamydia strain, or produced by recombinant means.

Consistent with the sixth aspect of the invention are
10 polypeptides, homologs or fragments which are modified or
treated to enhance their immunogenicity in the target animal, in
whom the polypeptide, homolog or fragments are intended to
confer protection against Chlamydia. Such modifications or
treatments include: amino acid substitutions with an amino acid
15 derivative such as 3-methyhistidine, 4-hydroxyproline, 5hydroxylysine etc., modifications or deletions which are carried
out after preparation of the polypeptide, homolog or fragment,
such as the modification of free amino, carboxyl or hydroxyl
side groups of the amino acids.

20 Identification of homologous polypeptides or polypeptide derivatives encoded by polynucleotides of the invention which have specific antigenicity is achieved by screening for crossreactivity with an antiserum raised against the polypeptide of reference having an amino acid sequence of any one of SEQ ID 25 Nos: 27 to 45. The procedure is as follows: a monospecific hyperimmune antiserum is raised against a purified reference polypeptide, a fusion polypeptide (for example, an expression product of MBP, GST, or His-tag systems), or a synthetic peptide predicted to be antigenic. Where an antiserum is raised 30 against a fusion polypeptide, two different fusion systems are employed. Specific antigenicity can be determined according to a number of methods, including Western blot (Towbin et al., Proc. Natl. Acad. Sci. USA (1979) 76:4350), dot blot, and ELISA, as described below.

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In a Western blot assay, the product to be screened, either as a purified preparation or a total *E. coli* extract, is submitted to SDS-Page electrophoresis as described by Laemmli (Nature (1970) 227:680). After transfer to a nitrocellulose 5 membrane, the material is further incubated with the monospecific hyperimmune antiserum diluted in the range of dilutions from about 1:5 to about 1:5000, preferably from about 1:100 to about 1:500. Specific antigenicity is shown once a band corresponding to the product exhibits reactivity at any of 10 the dilutions in the above range.

In an ELISA assay, the product to be screened is preferably used as the coating antigen. A purified preparation is preferred, although a whole cell extract can also be used. Briefly, about 100 µl of a preparation at about 10 µg protein/ml 15 are distributed into wells of a 96-well polycarbonate ELISA plate. The plate is incubated for 2 hours at 37°C then overnight at 4°C. The plate is washed with phosphate buffer saline (PBS) containing 0.05% Tween 20 (PBS/Tween buffer). wells are saturated with 250 µl PBS containing 1% bovine serum 20 albumin (BSA) to prevent non-specific antibody binding. After 1 hour incubation at 37°C, the plate is washed with PBS/Tween buffer. The antiserum is serially diluted in PBS/Tween buffer containing 0.5% BSA. 100 µl of dilutions are added per well. The plate is incubated for 90 minutes at 37°C, washed and 25 evaluated according to standard procedures. For example, a goat anti-rabbit peroxidase conjugate is added to the wells when specific antibodies were raised in rabbits. Incubation is carried out for 90 minutes at 37°C and the plate is washed. The reaction is developed with the appropriate substrate and the 30 reaction is measured by colorimetry (absorbance measured spectrophotometrically). Under the above experimental conditions, a positive reaction is shown by O.D. values greater than a non immune control serum.

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In a dot blot assay, a purified product is preferred, although a whole cell extract can also be used. Briefly, a solution of the product at about 100 µg/ml is serially two-fold diluted in 50 mM Tris-HCl (pH 7.5). 100 µl of each dilution are 5 applied to a nitrocellulose membrane 0.45 µm set in a 96-well dot blot apparatus (Biorad). The buffer is removed by applying vacuum to the system. Wells are washed by addition of 50 mM Tris-HCl (pH 7.5) and the membrane is air-dried. The membrane is saturated in blocking buffer (50 mM Tris-HCl (pH 7.5) 0.15 M 10 NaCl, 10 g/L skim milk) and incubated with an antiserum dilution from about 1:50 to about 1:5000, preferably about 1:500. reaction is revealed according to standard procedures. For example, a goat anti-rabbit peroxidase conjugate is added to the wells when rabbit antibodies are used. Incubation is carried 15 out 90 minutes at 37°C and the blot is washed. The reaction is developed with the appropriate substrate and stopped. reaction is measured visually by the appearance of a colored spot, e.g., by colorimetry. Under the above experimental conditions, a positive reaction is shown once a colored spot is 20 associated with a dilution of at least about 1:5, preferably of at least about 1:500.

Therapeutic or prophylactic efficacy of a polypeptide or derivative of the invention can be evaluated as described below. A seventh aspect of the invention provides (i) a composition of 25 matter comprising a polypeptide of the invention together with a diluent or carrier; specifically (ii) a pharmaceutical composition containing a therapeutically or prophylactically effective amount of a polypeptide of the invention; (iii) a method for inducing an immune response against Chlamydia in a 30 mammal, by administering to the mammal an immunogenically effective amount of a polypeptide of the invention to elicit a protective immune response to Chlamydia; and particularly, (iv) a method for preventing and/or treating a Chlamydia (e.g., C. trachomatis. C. psittaci, C. pneumoniae. or C. pecorum)

infection, by administering a prophylactic or therapeutic amount of a polypeptide of the invention to an infected individual.

Additionally, the seventh aspect of the invention encompasses the use of a polypeptide of the invention in the preparation of a medicament for preventing and/or treating Chlamydia infection.

As used herein, the immunogenic compositions of the invention are administered by conventional routes known the vaccine field, in particular to a mucosal (e.g., ocular, intranasal, pulmonary, oral, gastric, intestinal, rectal,

- 10 vaginal, or urinary tract) surface or via the parenteral (e.g., subcutaneous, intradermal, intramuscular, intravenous, or intraperitoneal) route. The choice of administration route depends upon a number of parameters, such as the adjuvant associated with the polypeptide. If a mucosal adjuvant is used,
- 15 the intranasal or oral route is preferred. If a lipid formulation or an aluminum compound is used, the parenteral route is preferred with the sub-cutaneous or intramuscular route being most preferred. The choice also depends upon the nature of the vaccine agent. For example, a polypeptide of the
- 20 invention fused to CTB or LTB is best administered to a mucosal surface.

As used herein, the composition of the invention contains one or several polypeptides or derivatives of the invention.

The composition optionally contains at least one additional Chlamydia antigen, or a subunit, fragment, homolog, mutant, or

25 Chlamydia antigen, or a subunit, fragment, homolog, mutant, or derivative thereof.

For use in a composition of the invention, a polypeptide or derivative thereof is formulated into or with liposomes, preferably neutral or anionic liposomes, microspheres, ISCOMS,

30 or virus-like-particles (VLPs) to facilitate delivery and/or enhance the immune response. These compounds are readily available to one skilled in the art; for example, see Liposomes: A Practical Approach (supra).

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Adjuvants other than liposomes and the like are also used and are known in the art. Adjuvants may protect the antigen from rapid dispersal by sequestering it in a local deposit, or they may contain substances that stimulate the host to secrete factors that are chemotactic for macrophages and other components of the immune system. An appropriate selection can conventionally be made by those skilled in the art, for example, from those described below.

Treatment is achieved in a single dose or repeated as

10 necessary at intervals, as can be determined readily by one
skilled in the art. For example, a priming dose is followed by
three booster doses at weekly or monthly intervals. An
appropriate dose depends on various parameters including the
recipient (e.g., adult or infant), the particular vaccine

15 antigen, the route and frequency of administration, the
presence/absence or type of adjuvant, and the desired effect
(e.g., protection and/or treatment), as can be determined by one
skilled in the art. In general, a vaccine antigen of the
invention is administered by a mucosal route in an amount from
20 about 10 µg to about 500 mg, preferably from about 1 mg to about
200 mg. For the parenteral route of administration, the dose
usually does not exceed about 1 mg, preferably about 100 µg.

When used as vaccine agents, polynucleotides and polypeptides of the invention may be used sequentially as part 25 of a multistep immunization process. For example, a mammal is initially primed with a vaccine vector of the invention such as a pox virus, e.g., via the parenteral route, and then boosted twice with the polypeptide encoded by the vaccine vector, e.g., via the mucosal route. In another example, liposomes associated 30 with a polypeptide or derivative of the invention is also used for priming, with boosting being carried out mucosally using a soluble polypeptide or derivative of the invention in combination with a mucosal adjuvant (e.g., LT).

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A polypeptide derivative of the invention is also used in accordance with the seventh aspect as a diagnostic reagent for detecting the presence of anti-Chlamydia antibodies, e.g., in a blood sample. Such polypeptides are about 5 to about 80, 5 preferably about 10 to about 50 amino acids in length. They are either labeled or unlabeled, depending upon the diagnostic method. Diagnostic methods involving such a reagent are described below.

Upon expression of a DNA molecule of the invention, a
10 polypeptide or polypeptide derivative is produced and purified
using known laboratory techniques. As described above, the
polypeptide or polypeptide derivative may be produced as a
fusion protein containing a fused tail that facilitates
purification. The fusion product is used to immunize a small
15 mammal, e.g., a mouse or a rabbit, in order to raise antibodies
against the polypeptide or polypeptide derivative (monospecific
antibodies). Accordingly, an eighth aspect of the invention
provides a monospecific antibody that binds to a polypeptide or
polypeptide derivative of the invention.

By "monospecific antibody" is meant an antibody that is capable of reacting with a unique naturally-occurring Chlamydia polypeptide. An antibody of the invention is either polyclonal or monoclonal. Monospecific antibodies may be recombinant, e.g., chimeric (e.g., constituted by a variable region of murine origin associated with a human constant region), humanized (a human immunoglobulin constant backbone together with hypervariable region of animal, e.g., murine, origin), and/or single chain. Both polyclonal and monospecific antibodies may also be in the form of immunoglobulin fragments, e.g., F(ab)'2 or Fab fragments. The antibodies of the invention are of any isotype, e.g., IgG or IgA, and polyclonal antibodies are of a single isotype or a mixture of isotypes.

Antibodies against the polypeptides, homologs or fragments of the present invention are generated by immunization

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of a mammal with a composition comprising said polypeptide, homolog or fragment. Scu antibodies may be polyclonal or monoclonal. Methods to produce polyclonal or monoclonal antibodies are well known in the art. For a review, see

5 "Antibodies, A Laboratory Manual, Cold Spring Harbor Laboratory, Eds. E. Harlow and D. Lane (1988), and D.E. Yelton et al., 1981. Ann. Rev. Biochem. 50:657-680. For monoclonal antibodies, see Kohl and Milstein?...

The antibodies of the invention, which are raised to a

10 polypeptide or polypeptide derivative of the invention, are
produced and identified using standard immunological assays,
e.g., Western blot analysis, dot blot assay, or ELISA (see,
e.g., Coligan et al., Current Protocols in Immunology (1994)
John Wiley & Sons, Inc., New York, NY). The antibodies are used

15 in diagnostic methods to detect the presence of a Chlamydia
antigen in a sample, such as a biological sample. The
antibodies are also used in affinity chromatography for
purifying a polypeptide or polypeptide derivative of the
invention. As is discussed further below, such antibodies may

20 be used in prophylactic and therapeutic passive immunization
methods.

Accordingly, a ninth aspect of the invention provides

(i) a reagent for detecting the presence of *Chlamydia* in a biological sample that contains an antibody, polypeptide, or 25 polypeptide derivative of the invention; and (ii) a diagnostic method for detecting the presence of *Chlamydia* in a biological sample, by contacting the biological sample with an antibody, a polypeptide, or a polypeptide derivative of the invention, such that an immune complex is formed, and by detecting such complex 30 to indicate the presence of *Chlamydia* in the sample or the organism from which the sample is derived.

Those skilled in the art will readily understand that the immune complex is formed between a component of the sample and the antibody, polypeptide, or polypeptide derivative, whichever

is used, and that any unbound material is removed prior to detecting the complex. It is understood that a polypeptide reagent is useful for detecting the presence of anti-Chlamydia antibodies in a sample, e.g., a blood sample, while an antibody of the invention is used for screening a sample, such as a gastric extract or biopsy, for the presence of Chlamydia polypeptides.

For diagnostic applications, the reagent (i.e., the antibody, polypeptide, or polypeptide derivative of the 10 invention) is either in a free state or immobilized on a solid support, such as a tube, a bead, or any other conventional support used in the field. Immobilization is achieved using direct or indirect means. Direct means include passive adsorption (non-covalent binding) or covalent binding between 15 the support and the reagent. By "indirect means" is meant that an anti-reagent compound that interacts with a reagent is first attached to the solid support. For example, if a polypeptide reagent is used, an antibody that binds to it can serve as an anti-reagent, provided that it binds to an epitope that is not 20 involved in the recognition of antibodies in biological samples. Indirect means may also employ a ligand-receptor system, for example, where a molecule such as a vitamin is grafted onto the polypeptide reagent and the corresponding receptor immobilized on the solid phase. This is illustrated by the biotin-25 streptavidin system. Alternatively, a peptide tail is added chemically or by genetic engineering to the reagent and the grafted or fused product immobilized by passive adsorption or covalent linkage of the peptide tail.

Such diagnostic agents may be included in a kit which

30 also comprises instructions for use. The reagent are labeled
with a detection means which allows for the detection of the
reagent when it is bound to its target. The detection means may
be a fluorescent agent such as fluorescein isocyanate or
fluorescein isothiocyanate, or an enzyme such as horse radish

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peroxidase or luciferase or alkaline phosphatase, or a radioactive element such as ^{125}I or ^{51}Cr .

Accordingly, a tenth aspect of the invention provides a process for purifying, from a biological sample, a polypeptide 5 or polypeptide derivative of the invention, which involves carrying out antibody-based affinity chromatography with the biological sample, wherein the antibody is a monospecific antibody of the invention.

For use in a purification process of the invention, the 10 antibody is either polyclonal or monospecific, and preferably is of the IgG type. Purified IgGs is prepared from an antiserum using standard methods (see, e.g., Coligan et al., supra). Conventional chromatography supports, as well as standard methods for grafting antibodies, are described in, e.g., 15 Antibodies: A Laboratory Manual, D. Lane, E. Harlow, Eds. (1988) and outlined below.

Briefly, a biological sample, such as an *C. pneumoniae* extract preferably in a buffer solution, is applied to a chromatography material, preferably equilibrated with the buffer 20 used to dilute the biological sample so that the polypeptide or polypeptide derivative of the invention (*i.e.*, the antigen) is allowed to adsorb onto the material. The chromatography material, such as a gel or a resin coupled to an antibody of the invention, is in either a batch form or a column. The unbound 25 components are washed off and the antigen is then eluted with an appropriate elution buffer, such as a glycine buffer or a buffer containing a chaotropic agent, *e.g.*, guanidine HCl, or high salt concentration (*e.g.*, 3 M MgCl₂). Eluted fractions are recovered and the presence of the antigen is detected, *e.g.*, by measuring 30 the absorbance at 280 nm.

An eleventh aspect of the invention provides (i) a composition of matter comprising a monospecific antibody of the invention, together with a diluent or carrier; (ii) a pharmaceutical composition comprising a therapeutically or

prophylactically effective amount of a monospecific antibody of the invention, and (iii) a method for treating or preventing a Chlamydia (e.g., C. trachomatis, C. psittaci, C. pneumoniae or C. pecorum) infection, by administering a therapeutic or prophylactic amount of a monospecific antibody of the invention to an infected individual. Additionally, the eleventh aspect of the invention encompasses the use of a monospecific antibody of the invention in the preparation of a medicament for treating or preventing Chlamydia infection.

The monospecific antibody is either polyclonal or 10 monoclonal, preferably of the IgA isotype (predominantly). passive immunization, the antibody is administered to a mucosal surface of a mammal, e.g., the gastric mucosa, e.g., orally or intragastrically, advantageously, in the presence of a 15 bicarbonate buffer. Alternatively, systemic administration, not requiring a bicarbonate buffer, is carried out. A monospecific antibody of the invention is administered as a single active component or as a mixture with at least one monospecific antibody specific for a different Chlamydia polypeptide. The 20 amount of antibody and the particular regimen used are readily determined by one skilled in the art. For example, daily administration of about 100 to 1,000 mg of antibodies over one week, or three doses per day of about 100 to 1,000 mg of antibodies over two or three days, are effective regimens for 25 most purposes.

Therapeutic or prophylactic efficacy are evaluated using standard methods in the art, e.g., by measuring induction of a mucosal immune response or induction of protective and/or therapeutic immunity, using, e.g., the C. pneumoniae mouse 30 model. Those skilled in the art will readily recognize that the C. pneumoniae strain of the model may be replaced with another Chlamydia strain. For example, the efficacy of DNA molecules and polypeptides from C. pneumoniae is preferably evaluated in a mouse model using C. pneumoniae strain. Protection is

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determined by comparing the degree of *Chlamydia* infection to that of a control group. Protection is shown when infection is reduced by comparison to the control group. Such an evaluation is made for polynucleotides, vaccine vectors, polypeptides and 5 derivatives thereof, as well as antibodies of the invention.

Adjuvants useful in any of the vaccine compositions described above are as follows.

Adjuvants for parenteral administration include aluminum compounds, such as aluminum hydroxide, aluminum phosphate, and 10 aluminum hydroxy phosphate. The antigen is precipitated with, or adsorbed onto, the aluminum compound according to standard protocols. Other adjuvants, such as RIBI (ImmunoChem, Hamilton, MT), is used in parenteral administration.

Adjuvants for mucosal administration include bacterial toxins, e.g., the cholera toxin (CT), the E. coli heat-labile toxin (LT), the Clostridium difficile toxin A and the pertussis toxin (PT), or combinations, subunits, toxoids, or mutants thereof such as a purified preparation of native cholera toxin subunit B (CTB). Fragments, homologs, derivatives, and fusions to any of these toxins are also suitable, provided that they retain adjuvant activity. Preferably, a mutant having reduced toxicity is used. Suitable mutants are described, e.g., in WO 95/17211 (Arg-7-Lys CT mutant), WO 96/6627 (Arg-192-Gly LT mutant), and WO 95/34323 (Arg-9-Lys and Glu-129-Gly PT mutant).

- 25 Additional LT mutants that are used in the methods and compositions of the invention include, e.g., Ser-63-Lys, Ala-69-Gly, Glu-110-Asp, and Glu-112-Asp mutants. Other adjuvants, such as a bacterial monophosphoryl lipid A (MPLA) of, e.g., E. coli, Salmonella minnesota, Salmonella typhimurium, or Shigella
- 30 flexneri; saponins, or polylactide glycolide (PLGA) microspheres, is also be used in mucosal administration.

Adjuvants useful for both mucosal and parenteral administrations include polyphosphazene (WO 95/2415), DC-chol (3

b-(N-(N',N'-dimethyl aminomethane)-carbamoyl) cholesterol; U.S. Patent No. 5,283,185 and WO 96/14831) and QS-21 (WO 88/9336).

Any pharmaceutical composition of the invention containing a polynucleotide, a polypeptide, a polypeptide

5 derivative, or an antibody of the invention, is manufactured in a conventional manner. In particular, it is formulated with a pharmaceutically acceptable diluent or carrier, e.g., water or a saline solution such as phosphate buffer saline. In general, a diluent or carrier is selected on the basis of the mode and

10 route of administration, and standard pharmaceutical practice. Suitable pharmaceutical carriers or diluents, as well as pharmaceutical necessities for their use in pharmaceutical formulations, are described in Remington's Pharmaceutical Sciences, a standard reference text in this field and in the

15 USP/NF.

The invention also includes methods in which Chlamydia infection are treated by oral administration of a Chlamydia polypeptide of the invention and a mucosal adjuvant, in combination with an antibiotic, an antacid, sucralfate, or a 20 combination thereof. Examples of such compounds that can be administered with the vaccine antigen and the adjuvant are antibiotics, including, e.g., macrolides, tetracyclines, and derivatives thereof (specific examples of antibiotics that can be used include azithromycin or doxicyclin or immunomodulators 25 such as cytokines or steroids). In addition, compounds containing more than one of the above-listed components coupled together, are used. The invention also includes compositions for carrying out these methods, i.e., compositions containing a Chlamydia antigen (or antigens) of the invention, an adjuvant, 30 and one or more of the above-listed compounds, in a pharmaceutically acceptable carrier or diluent.

Amounts of the above-listed compounds used in the methods and compositions of the invention are readily determined by one skilled in the art. Treatment/immunization schedules are also

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known and readily designed by one skilled in the art. For example, the non-vaccine components can be administered on days 1-14, and the vaccine antigen + adjuvant can be administered on days 7, 14, 21, and 28.

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CLAIMS:

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- 1. A nucleic acid molecule comprising a nucleic acid sequence which encodes a polypeptide selected from any of:
 - (a) SEQ ID Nos: 27 to 45;
- (b) an immunogenic fragment comprising at least 12 consecutive amino acids from a polypeptide of (a); and
- (c) a polypeptide of (a) or (b) which has been modified without loss of immunogenicity, wherein said modified polypeptide is at least 75% identical in amino acid sequence to the corresponding polypeptide of (a) or (b).
- 2. A nucleic acid molecule comprising a nucleic acid sequence selected from any of:
 - (a) SEQ ID Nos: 1 to 26;
- (b) a sequence which encodes a polypeptide encoded by 15 any one of SEQ ID Nos: 1 to 26;
 - (c) a sequence comprising at least 38 consecutive nucleotides from any one of the nucleic acid sequences of (a) and (b); and
- (d) a sequence which encodes a polypeptide which is 20 at least 75% identical in amino acid sequence to any one of the polypeptides encoded by SEQ ID Nos: 1 to 26.
 - 3. A nucleic acid molecule comprising a nucleic acid sequence which is anti-sense to the nucleic acid molecule of claim 1.
- 25 4. A nucleic acid molecule comprising a nucleic acid sequence which encodes a fusion protein, said fusion protein comprising a polypeptide encoded by a nucleic acid molecule according to claim 1 and a second polypeptide.

- 5. The nucleic acid molecule of claim 4 wherein the second polypeptide is a heterologous signal peptide.
- 6. The nucleic acid molecule of claim 4 wherein the second polypeptide has adjuvant activity.
- 5 7. A nucleic acid molecule according to claim 1, operatively linked to one or more expression control sequences.
 - 8. A vaccine comprising a vaccine vector and at least one first nucleic acid selected from any of:
 - (i) SEQ ID Nos: 1 to 26;
- 10 (ii) a nucleic acid sequence which encodes a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
 - (iii) a nucleic acid sequence comprising at least 38
 consecutive nucleotides from any one of the nucleic acid
 sequences of (i) and (ii);
- 15 (iv) a nucleic acid sequence which encodes a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- (v) a nucleic acid sequence which encodes a
 20 polypeptide whose sequence is set forth in any one of SEQ ID
 Nos: 27 to 45;
 - (vi) a nucleic acid sequence which encodes an immunogenic fragment comprising at least 12 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
- 25 (vii) a nucleic acid sequence which encodes a polypeptide as defined in (v) or an immunogenic fragment as defined in (vi) which has been modified without loss of immunogenicity, wherein said modified polypeptide or fragment is at least 75% identical in amino acid sequence to the

corresponding polypeptide of (v) or the corresponding fragment of (vi);

wherein each first nucleic acid is capable of being expressed.

- 5 9. A vaccine comprising a vaccine vector and at least one first nucleic acid encoding a fusion protein, wherein the fusion protein comprises:
 - (a) a first polypeptide selected from any of:
- (i) a polypeptide encoded by any one of SEQ ID Nos: 1
 10 to 26;
 - (ii) a polypeptide encoded by a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of SEQ ID Nos: 1 to 26;
- (iii) a polypeptide which is at least 75% identical
 15 in amino acid sequence to the polypeptide encoded by any one of
 SEQ ID Nos: 1 to 26;
 - (iv) a polypeptide whose sequence is set forth in any one of SEO ID Nos: 27 to 45;
- (v) an immunogenic fragment comprising at least 12 20 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
 - (vi) a polypeptide as defined (iv) or an immunogenic fragment as defined in (v) which has been modified without loss of immunogenicity, wherein said modified polypeptide or
- fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (iv) or the corresponding fragment of (v); and
 - (b) a second polypeptide;

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wherein each first nucleic acid is capable of being expressed.

- 10. The vaccine of claim 9 wherein the second polypeptide is a heterologous signal peptide.
- 5 11. The vaccine of claim 9 wherein the second polypeptide has adjuvant activity.
 - 12. The vaccine of claim 8 wherein each first nucleic acid is operatively linked to one or more expression control sequences.
- 10 13. A vaccine according to claim 8 wherein each first nucleic acid is expressed as a polypeptide, and wherein the vaccine comprises a second nucleic acid encoding an additional polypeptide which enhances the immune response to the polypeptide expressed by the first nucleic acid.
- 15 14. The vaccine of claim 13 wherein the second nucleic acid encodes an additional *Chlamydia* polypeptide.
 - 15. A pharmaceutical composition comprising a nucleic acid according to claim 1 and a pharmaceutically acceptable carrier.
- 20 16. A pharmaceutical composition comprising a vaccine according to claim 8 and a pharmaceutically acceptable carrier.
 - 17. A unicellular host transformed with the nucleic acid molecule of claim 7.
- 18. An isolated nucleic acid probe of 5 to 100
 25 nucleotides which hybridizes under stringent conditions to any one of nucleic acid molecules of SEQ ID Nos: 1 to 26, or to a complementary or anti-sense sequence of said nucleic acid molecule.
- 19. A primer of 10 to 40 nucleotides which hybridizes
 30 under stringent conditions to any one of nucleic acid molecules

of SEQ ID Nos: 1 to 26, or to a homolog or complementary or anti-sense sequence of said nucleic acid molecule.

- 20. A polypeptide encoded by a nucleic acid sequence according to claim 2.
- 5 21. A polypeptide comprising an amino acid sequence selected from any of:
 - (a) SEQ ID Nos: 27 to 45;
 - (b) an immunogenic fragment comprising at least 12 consecutive amino acids from a polypeptide of (a); and
- 10 (c) a polypeptide of (a) or (b) which has been modified without loss of immunogenicity, wherein said modified polypeptide is at least 75% identical in amino acid sequence to the corresponding polypeptide of (a) or (b).
- 22. A fusion protein comprising a polypeptide of claim 20 and a second polypeptide.
 - 23. The fusion protein of claim 22 wherein the second polypeptide is a heterologous signal peptide.
 - 24. The fusion protein of claim 22 wherein the second polypeptide has adjuvant activity.
- 20 25. A method for producing a polypeptide of claim 20, comprising the step of culturing a unicellular host of claim 17.
 - 26. An antibody against the polypeptide of claim 20.
- 27. A vaccine comprising at least one first polypeptide 25 selected from any of:
 - (i) a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;

- (ii) a polypeptide encoded by a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of SEQ ID Nos: 1 to 26;
- (iii) a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEO ID Nos: 1 to 26;
 - (iv) a polypeptide whose sequence is set forth in any one of SEQ ID Nos: 27 to 45;
- (v) an immunogenic fragment comprising at least 12 10 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
- (vi) a polypeptide as defined in (iv) or an immunogenic fragment as defined in (v) which has been modified without loss of immunogenicity, wherein said modified
 15 polypeptide or fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (iv) or the corresponding fragment of (v).
 - 28. A vaccine comprising at least one fusion protein, wherein the fusion protein comprises:
- 20 (a) a first polypeptide selected from any of:
 - (i) a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- (ii) a polypeptide encoded by a nucleic acid sequence comprising at least 38 consecutive nucleotides from any one of 25 SEQ ID Nos: 1 to 26;
 - (iii) a polypeptide which is at least 75% identical in amino acid sequence to the polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- (iv) a polypeptide whose sequence is set forth in any 30 one of SEQ ID Nos: 27 to 45;

- (v) an immunogenic fragment comprising at least 12 consecutive amino acids from any one of SEQ ID Nos: 27 to 45; and
- (vi) a polypeptide as defined (iv) or an immunogenic fragment as defined in (v) which has been modified without loss of immunogenicity, wherein said modified polypeptide or fragment is at least 75% identical in amino acid sequence to the corresponding polypeptide of (iv) or the corresponding fragment of (v); and
- 10 (b) a second polypeptide.

- 29. The vaccine of claim 28 wherein the second polypeptide is a heterologous signal peptide.
- 30. The vaccine of claim 28 wherein the second polypeptide has adjuvant activity.
- 15 31. A vaccine comprising at least one first polypeptide according to claim 20 and an additional polypeptide which enhances the immune response to the first polypeptide.
 - 32. The vaccine of claim 31 wherein the additional polypeptide comprises a *Chlamydia* polypeptide.
- 20 33. A pharmaceutical composition comprising a polypeptide according to claim 20 and a pharmaceutically acceptable carrier.
 - 34. A pharmaceutical composition comprising a vaccine according to claim 27 and a pharmaceutically acceptable carrier.
 - 35. A pharmaceutical composition comprising an antibody according to claim 26 and a pharmaceutically acceptable carrier.

- 36. A method for preventing or treating *Chlamydia* infection comprising administering to a patient an effective amount of:
 - (a) a nucleic acid molecule according to claim 2;
- 5 (b) a vaccine comprising a vaccine vector and at least one first nucleic acid according to claim 2;
 - (c) a pharmaceutical composition comprising a nucleic acid according to claim 2 and a pharmaceutically acceptable carrier;
- 10 (d) a polypeptide encoded by a nucleic acid sequence according to claim 2; or
 - (e) an antibody against a polypeptide encoded by a nucleic acid sequence according to claim 2.
- 37. A method of detecting *Chlamydia* infection comprising
 15 the step of contacting a body fluid of a mammal to be tested,
 with a component selected from any one of:
 - (a) a nucleic acid molecule according to claim 2;
 - (b) a polypeptide encoded by a nucleic acid sequence according to claim 2; and
- 20 (c) an antibody against a polypeptide encoded by a nucleic acid sequence according to claim 2.
 - 38. A diagnostic kit comprising instructions for use and a component selected from any one of:
 - (a) a nucleic acid molecule according to claim 2;
- 25 (b) a polypeptide encoded by a nucleic acid sequence according to claim 2; and
 - (c) an antibody against a polypeptide encoded by a nucleic acid sequence according to claim 2.

- 39. A method for identifying a polypeptide of claim 20 which induces an immune response effective to prevent or lessen the severity of *Chlamydia* infection in a mammal previously immunized with polypeptide, comprising the steps of:
- (a) immunizing a mouse with a polypeptide of claim20; and

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(b) inoculating the immunized mouse with Chlamydia;

wherein the polypeptide which prevents or lessens the severity of *Chlamydia* infection in the immunized mouse compared to a non-immunized control mouse is identified.

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CLAIMS

- 1. A nucleic acid molecule comprising a nucleic acid sequence which encodes a polypeptide selected from any of:
- 5 (a) SEQ ID Nos: 27 to 45;
 - (b) an immunogenic fragment comprising at least 12 consecutive amino acids from a polypeptide of (a); and
 - (c) a polypeptide of (a) or (b) which has been modified to improve its immunogenicity, wherein said modified polypeptide is at least 75% identical in amino acid sequence to the corresponding polypeptide of (a) or (b).
- 2. A nucleic acid molecule comprising a nucleic acid15 sequence selected from any of:
 - (a) SEQ ID Nos: 1 to 26;
 - (b) a sequence which encodes a polypeptide encoded by any one of SEQ ID Nos: 1 to 26;
- (c) a sequence comprising at least 38 consecutive

 nucleotides from any one of the nucleic acid sequences

 of (a) and (b); and
 - (d) a sequence which encodes a polypeptide which is at least 75% identical in amino acid sequence to any one of the polypeptides encoded by SEQ ID Nos: 1 to 26.

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- 3. A nucleic acid molecule comprising a nucleic acid sequence which encodes a fusion protein, said fusion protein comprising a polypeptide encoded by a nucleic acid molecule according to claim 1 and an additional polypeptide.
- 4. A nucleic acid molecule according to claim 1, operatively linked to one or more expression control sequences.

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- 5. A vaccine comprising at least one first nucleic acid according to any one of claims 1 to 4 and a vaccine vector wherein each first nucleic acid is expressed as a polypeptide, the vaccine optionally comprising a second nucleic acid encoding an additional polypeptide which enhances the immune response to the polypeptide expressed by said first nucleic acid.
- 6. The vaccine of claim 5 wherein the second nucleic acid encodes an additional *Chlamydia* polypeptide.
 - 7. A pharmaceutical composition comprising a nucleic acid according to any one of claims 1 to 5 and a pharmaceutically acceptable carrier.

- 8. A pharmaceutical composition comprising a vaccine according to claim 5 or 6 and a pharmaceutically acceptable carrier.
- 5 9. A unicellular host transformed with the nucleic acid molecule of claim 4.
- 10. A nucleic acid probe of 5 to 100 nucleotides which hybridizes under stringent conditions to any one of nucleic acid molecules of SEQ ID Nos: 1 to 26, or to a homolog or complementary or anti-sense sequence of said nucleic acid molecule.
- 11. A primer of 10 to 40 nucleotides which hybridizes

 15 under stringent conditions to any one of nucleic acid

 molecules of SEQ ID Nos: 1 to 26, or to a homolog or

 complementary or anti-sense sequence of said nucleic acid

 molecule.
- 20 12. A polypeptide encoded by a nucleic acid sequence according to any one of claims 1 to 4.
 - 13. A polypeptide comprising an amino acid sequence selected from any of:
- 25 (a) SEQ ID Nos: 27 to 45;

57

- (b) an immunogenic fragment comprising at least 12 consecutive amino acids from a polypeptide of (a); and
- (c) a polypeptide of (a) or (b) which has been modified to improve its immunogenicity, wherein said modified polypeptide is at least 75% identical in amino acid sequence to the corresponding polypeptide of (a) or (b).
- 14. A fusion polypeptide comprising a polypeptide of claim

 10 12 or 13 and an additional polypeptide.
 - 15. A method for producing a polypeptide of claim 12 or 13, comprising the step of culturing a unicellular host according to claim 9.

- 16. An antibody against the polypeptide of any one of claims 12 to 14.
- 17. A vaccine comprising at least one first polypeptide

 20 according to any one of claims 12 to 14 and a

 pharmaceutically acceptable carrier, optionally comprising
 a second polypeptide which enhances the immune response to
 the first polypeptide.
- 25 18. The vaccine of claim 17 wherein the second polypeptide comprises an additional *Chlamydia* polypeptide.

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19. A pharmaceutical composition comprising a polypeptide according to any one of claims 12 to 14 and a pharmaceutically acceptable carrier.

- 20. A pharmaceutical composition comprising a vaccine according to claim 17 or 18 and a pharmaceutically acceptable carrier.
- 10 21. A pharmaceutical composition comprising an antibody according to claim 16 and a pharmaceutically acceptable carrier.
- 22. A method for preventing or treating Chlamydia
 15 infection using:
 - (a) the nucleic acid of any one of claims 1 to 4;
 - (b) the vaccine of any one of claims 5, 6, 17 and 18;
 - (c) the pharmaceutical composition of any one of claims 7, 8, 19 to 21;
- 20 (d) the polypeptide of any one of claims 12 to 14; or
 - (e) the antibody of claim 16.
- 23. A method of detecting *Chlamydia* infection comprising the step of assaying a body fluid of a mammal to be tested,

 with a component selected from any one of:
 - (a) the nucleic acid of any one of claims 1 to 4;

- (b) the polypeptide of any one of claims 12 to 14; and
- (c) the antibody of claim 16.
- 24. A diagnostic kit comprising instructions for use and a component selected from any one of:
 - (a) the nucleic acid of any one of claims 1 to 4;
 - (b) the polypeptide of any one of claims 12 to 14; and the antibody of claim 16.

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A) Tide. CHI AMUDIA ANTICENE AND CODDECDONDING DNA ED ACMENTE

(54) Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

(57) Abstract: The present invention provides purified and isolated polynucleotide molecules that encode *Chlamydia* polypeptides which can be used in methods to prevent, treat, and diagnose *Chlamydia* infection. In one form of the invention, the polynucleotide molecules are selected from DNA that encode polypeptides CPN100397 (SEQ ID Nos: 1 and 2), CPN100421 (SEQ ID Nos: 3 and 4), CPN100422 (SEQ ID Nos: 4 and 6), CPN100424 (SEQ ID Nos: 7 and 8), CPN100426 (SEQ ID Nos: 9 and 10), CPN100508 (SEQ ID Nos: 11 and 12), CPN100515 (SEQ ID Nos: 13 and 14), CPN100538 (SEQ ID Nos: 15 and 16), CPN100557 (SEQ ID Nos: 17 and 18), CPN100622 (SEQ ID Nos: 19 and 20), CPN100626 (SEQ ID Nos: 21 and 22), CPN100628 (SEQ ID Nos: 23 and 24) and CPN100630 (SEQ ID Nos: 25 and 26).



Title: CHLAMYDIA ANTIGENS AND TO SERVICE CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

WO 00/24765

PCT/CA99/00992

Figure 1: CPN100397												
attttaacgt gcgtatcatt tgtgactaag agatagactt gctttcttta tctatcttct 60												
gtattggaaa gaa	agcccct tgagg	gaaaa aaaggttgtt	t atg aag att cca Met Lys Ile Pro 1	ctc 115 Leu 5								
cgc ttt tta tt Arg Phe Leu Le	g ata tca tta u Ile Ser Leu 10	gta cct acg ctt Val Pro Thr Let 15	t tct atg tcg aat u Ser Met Ser Asn 20	tta 163 Leu								
tta gga gct gc Leu Gly Ala Al 2	a Thr Thr Glu	gag tta tcg gct Glu Leu Ser Ala 30	t agc aat agc ttc a Ser Asn Ser Phe 35	gat 211 Asp								
gga act aca to Gly Thr Thr Se 40	a aca aca agc r Thr Thr Ser	ttt tct agt aaa Phe Ser Ser Lys 45	a aca tca tcg gct s Thr Ser Ser Ala 50	aca 259 Thr								
gat ggc acc aa Asp Gly Thr As 55	t tat gtt ttt n Tyr Val Phe 60	Lys Asp Ser Va	a gtt ata gaa aat l Val Ile Glu Asn 65	gta 307 Val								
ccc aaa aca gg Pro Lys Thr Gl 70	g gaa act cag y Glu Thr Gln 75	tot act agt tg Ser Thr Ser Cy:	t ttt aaa aat gac s Phe Lys Asn Asp 0	gct 355 Ala 85								
gca gct gga ga Ala Ala Gly As	t cta aat ttc p Leu Asn Phe 90	tta gga ggg gg Leu Gly Gly Gl 95	a ttt tct ttc aca y Phe Ser Phe Thr 100	ttt 403 Phe								
agc aat atc ga Ser Asn Ile As	p Ala Thr Thr	gct tct gga gc Ala Ser Gly Al 110	t gct att gga agt a Ala Ile Gly Ser 115	gaa 451 Glu								
gca gct aat aa Ala Ala Asn Ly 120	g aca gtc acg s Thr Val Thr	tta tca gga tt Leu Ser Gly Ph 125	t tcg gca ctt tct ne Ser Ala Leu Ser 130	ttt 499 Phe								
ctt aaa tcc co Leu Lys Ser Pr 135	a gca agt aca o Ala Ser Thr 140	Val Thr Asn Gl	ga ttg gga gct atc y Leu Gly Ala Ile 145	aat 547 Asn								
gtt aaa ggg aa Val Lys Gly As 150	t tta agc cta n Leu Ser Leu 155	ı ttg gat aat ga ı Leu Asp Asn As 16	it aag gta ttg att sp Lys Val Leu Ile so	cag 595 Gln 165								
gac aat ttc to Asp Asn Phe Se	a aca gga gat r Thr Gly Asr 170	ggc gga gca at Gly Gly Ala Il 175	it aat tgt gca ggc le Asn Cys Ala Gly 180	Ser								
ttg aag atc go Leu Lys Ile Al	.a Asn Asn Lys	g too ott tot tt s Ser Leu Ser Ph 190	tt att gga aat agt ne Ile Gly Asn Ser 195	tct 691 Ser								

Title: CHLAMYDIA ANTIGENS AND TO THE CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

Fig.	1 ((con	't)
1 14.		,	,

9.	. (-	,														
tca Ser	aca Thr	cgt Arg 200	ggc Gly	gga Gly	gcg Ala	att Ile	cat His 205	acc Thr	aaa Lys	aac Asn	ctc Leu	aca Thr 210	cta Leu	tct Ser	tct Ser	739
ggt Gly	999 Gly 215	gaa Glu	act Thr	cta Leu	ttt Phe	cag Gln 220	ggg ggg	aat Asn	aca Thr	gcg Ala	cct Pro 225	acg Thr	gct Ala	gct Ala	ggt Gly	787
aaa Lys 230	gga Gly	ggt Gly	gct Ala	atc Ile	gcg Ala 235	att Ile	gca Ala	gac Asp	tct Ser	ggc Gly 240	acc Thr	cta Leu	tcc Ser	att Ile	tct Ser 245	835
gga Gly	gac Asp	agt Ser	ggc Gly	gac Asp 250	att Ile	atc Ile	ttt Phe	gaa Glu	ggc Gly 255	aat Asn	acg Thr	ata Ile	gga Gly	gct Ala 260	aca Thr	883
gga Gly	acc Thr	gtc Val	tct Ser 265	cat His	agt Ser	gct Ala	att Ile	gat Asp 270	tta Leu	gga Gly	act Thr	agc Ser	gct Ala 275	aag Lys	ata Ile	931
act Thr	gcg Ala	tta Leu 280	cgt Arg	gct Ala	gcg Ala	caa Gln	gga Gly 285	cat His	acg Thr	ata Ile	tac Tyr	ttt Phe 290	tat Tyr	gat Asp	ccg Pro	979
att Ile	act Thr 295	gta Val	aca Thr	gga Gly	tcg Ser	aca Thr 300	tct Ser	gtt Val	gct Ala	gat Asp	gct Ala 305	ctc Leu	aat Asn	att Ile	aat Asn	1027
agc Ser 310	cct Pro	gat Asp	act Thr	gga Gly	gat Asp 315	aac Asn	aaa Lys	gag Glu	tat Tyr	acg Thr 320	gga Gly	acc Thr	ata Ile	gtc Val	ttt Phe 325	1075
tct Ser	gga Gly	gag Glu	aag Lys	ctc Leu 330	acg Thr	gag Glu	gca Ala	gaa Glu	gct Ala 335	aaa Lys	gat Asp	gag Glu	aag Lys	aac Asn 340	cgc Arg	1123
act Thr	tct Ser	aaa Lys	tta Leu 345	ctt Leu	caa Gln	aat Asn	gtt Val	gct Ala 350	ttt Phe	aaa Lys	aat Asn	Gly aaa	act Thr 355	gta Val	gtt Val	1171
tta Leu	aaa Lys	ggt Gly 360	gat Asp	gtc Val	gtt Val	tta Leu	agt Ser 365	gcg Ala	aac Asn	ggt Gly	ttc Phe	tct Ser 370	cag Gln	gat Asp	gca Ala	1219
aac Asn	tct Ser 375	aag Lys	ttg Leu	att Ile	atg Met	gat Asp 380	tta Leu	Gly	acg Thr	tcg Ser	ttg Leu 385	gtt Val	gca Ala	aac Asn	acc Thr	1267
gaa Glu 390	agt Ser	atc Ile	gag Glu	tta Leu	acg Thr 395	aat Asn	ttg Leu	gaa Glu	att Ile	aat Asn 400	ata Ile	gac Asp	tct Ser	ctc Leu	agg Arg 405	1315

Title: CHLAMYDIA ANTIGENS AND SUPPLY OF JULY 6 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fia.	1	(con't)
	•	(/

aac Asn	gly aaa	aaa Lys	aag Lys	ata Ile 410	aaa Lys	ctc Leu	agt Ser	gct Ala	gcc Ala 415	aca Thr	gct Ala	cag Gln	aaa Lys	gat Asp 420	att Ile	1363
cgt Arg	ata Ile	gat Asp	cgt Arg 425	cct Pro	gtt Val	gta Val	ctg Leu	gca Ala 430	att Ile	agc Ser	gat Asp	gag Glu	agt Ser 435	ttt Phe	tat Tyr	1411
caa Gln	aat Asn	ggc Gly 440	ttt Phe	ttg Leu	aat Asn	gag Glu	gac Asp 445	cat His	tcc Ser	tat Tyr	gat Asp	999 Gly 450	att Ile	ctt Leu	gag Glu	1459
tta Leu	gat Asp 455	gct Ala	gly ggg	aaa Lys	gac Asp	atc Ile 460	gtg Val	att Ile	tct Ser	gca Ala	gat Asp 465	tct Ser	cgc Arg	agt Ser	ata Ile	1507
gat Asp 470	gct Ala	gta Val	caa Gln	tct Ser	ccg Pro 475	tat Tyr	ggc Gly	tat Tyr	cag Gln	gga Gly 480	aag Lys	tgg Trp	acg Thr	atc Ile	aat Asn 485	1555
tgg Trp	tct Ser	act Thr	gat Asp	gat Asp 490	aag Lys	aaa Lys	gct Ala	acg Thr	gtt Val 495	tct Ser	tgg Trp	gcg Ala	aag Lys	cag Gln 500	agt Ser	1603
ttt Phe	aat Asn	ccc Pro	act Thr 505	gct Ala	gag Glu	cag Gln	gag Glu	gct Ala 510	ccg Pro	tta Leu	gtt Val	cct Pro	aat Asn 515	ctt Leu	ctt Leu	1651
tgg Trp	ggt Gly	tct Ser 520	ttt Phe	ata Ile	gat Asp	gtt Val	cgt Arg 525	tcc Ser	ttc Phe	cag Gln	aat Asn	ttt Phe 530	ata Ile	gag Glu	cta Leu	1699
ggt Gly	act Thr 535	gaa Glu	ggt Gly	gct Ala	cct Pro	tac Tyr 540	gaa Glu	aag Lys	aga Arg	ttt Phe	tgg Trp 545	gtt Val	gca Ala	ggc Gly	att Ile	1747
tcc Ser 550	aat Asn	gtt Val	ttg Leu	cat His	agg Arg 555	agc Ser	ggt Gly	cgt Arg	gaa Glu	aat Asn 560	caa Gln	agg Arg	aaa Lys	ttc Phe	cgt Arg 565	1795
cat His	gtg Val	agt Ser	gga Gly	ggt Gly 570	Ala	gta Val	Val	Gly	gct Ala 575	Ser	acg Thr	agg Arg	atg Met	ccg Pro 580	ggt Gly	1843
ggt Gly	gat Asp	acc Thr	ttg Leu 585	tct Ser	ctg Leu	ggt Gly	ttt Phe	gct Ala 590	cag Gln	ctc Leu	ttt Phe	gcg Ala	cgt Arg 595	gac Asp	aaa Lys	1891
gac Asp	tac Tyr	ttt Phe 600	Met	aat Asn	acc Thr	aat Asn	ttc Phe 605	gca Ala	aag Lys	acc Thr	tac Tyr	gca Ala 610	gga Gly	tct Ser	tta Leu	1939

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS OF FIG. 9 / B 3 0 4 4 6 AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig.	1 (c	on't)														
cgt Arg	ttg Leu 615	cag Gln	cac His	gat Asp	gct Ala	tcc Ser 620	cta Leu	tac Tyr	tct Ser	gtg Val	gtg Val 625	agt Ser	atc Ile	ctt Leu	tta Leu	1987
gga Gly 630	gag Glu	gga Gly	gga Gly	ctc Leu	cgc Arg 635	gag Glu	atc Ile	ctg Leu	ttg Leu	cct Pro 640	tat Tyr	gtt Val	tcc Ser	aag Lys	act Thr 645	2035
ctg Leu	ccg Pro	tgc Cys	tct Ser	ttc Phe 650	tat Tyr	GJÀ aaa	cag Gln	ctt Leu	agc Ser 655	tac Tyr	ggc Gly	cat His	acg Thr	gat Asp 660	cat His	2083
cgc Arg	atg Met	aag Lys	acc Thr 665	gag Glu	tct Ser	cta Leu	ccc Pro	ccc Pro 670	ccc Pro	ccc Pro	ccg Pro	acg Thr	ctc Leu 675	tcg Ser	acg Thr	2131
gat Asp	cat His	act Thr 680	tct Ser	tgg Trp	gga Gly	gga Gly	tat Tyr 685	gtc Val	tgg Trp	gct Ala	gga Gly	gag Glu 690	ctg Leu	gga Gly	act Thr	2179
cga Arg	gtt Val 695	gct Ala	gtt Val	gaa Glu	aat Asn	acc Thr 700	agc Ser	ggc Gly	aga Arg	gga Gly	ttt Phe 705	ttc Phe	caa Gln	gag Glu	tac Tyr	2227
act Thr 710	cca Pro	ttt Phe	gta Val	aaa Lys	gtc Val 715	caa Gln	gct Ala	gtt Val	tac Tyr	gct Ala 720	cgc Arg	caa Gln	gat Asp	agc Ser	ttt Phe 725	2275
gta Val	gaa Glu	cta Leu	gga Gly	gct Ala 730	atc Ile	agt Ser	cgt Arg	gat Asp	ttt Phe 735	agt Ser	gat Asp	tcg Ser	cat His	ctt Leu 740	tat Tyr	2323
			att Ile 745													2371
caa Gln	tat Tyr	tat Tyr 760	cat His	gtt Val	gta Val	gcg Ala	atg Met 765	tat Tyr	tct Ser	cca Pro	gat Asp	gtt Val 770	tgt Cys	cgt Arg	agt Ser	2419
aac Asn	ccc Pro 775	aaa Lys	tgt Cys	acg Thr	act Thr	acc Thr 780	cta Leu	ctt Leu	tcc Ser	aac Asn	caa Gln 785	ggg Gly	agt Ser	tgg Trp	aag Lys	2467
			tcg Ser													2515
ggt Gly	ttt Phe	cga Arg	tct Ser	ttg Leu 810	gga Gly	gct Ala	gca Ala	gca Ala	gag Glu 815	ctt Leu	ttc Phe	ggg Gly	aac Asn	ttt Phe 820	ggc Gly	2563

William States

CORRESPONDING DNA FRAGMENTS

AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 1 (con't)

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2611 ttt gaa tgg cgg gga tct tct cgt agc tat aat gta gat gcg ggt agc Phe Glu Trp Arg Gly Ser Ser Arg Ser Tyr Asn Val Asp Ala Gly Ser 825

aaa atc aaa ttt tagcgatttc tctttcgatg ctatttttcc atggctattt 2663 Lys Ile Lys Phe 840

ttaaaatqat aqccatggtt atagatacgt agtccttatt tcaaagaaga cactgttgca 2723

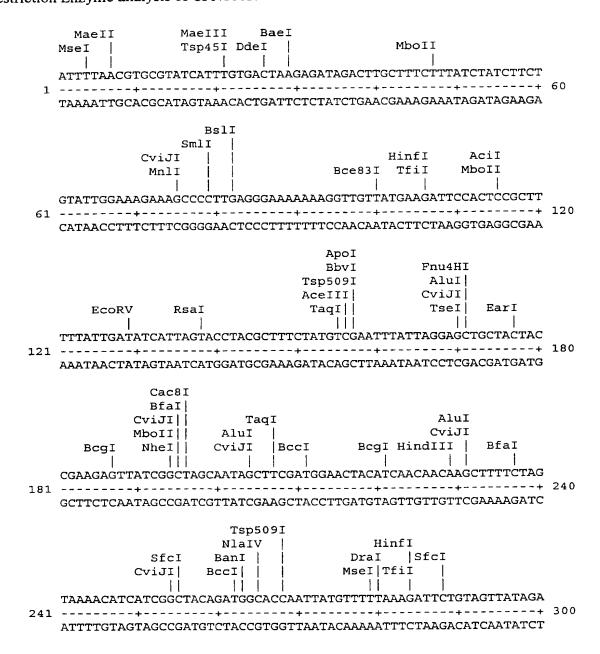
2750 ttagatacgc tctctgatcc ctcaaaa

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al.

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 2 (RY-32)
Restriction Enzyme analysis of CPN100397

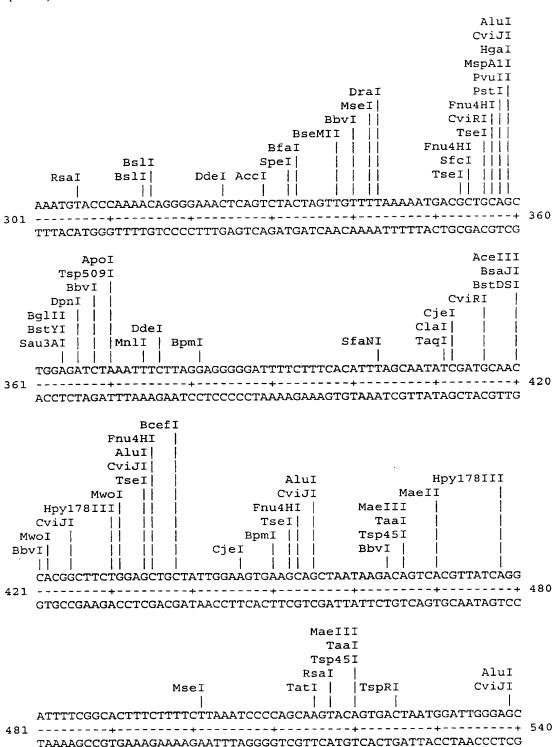


AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

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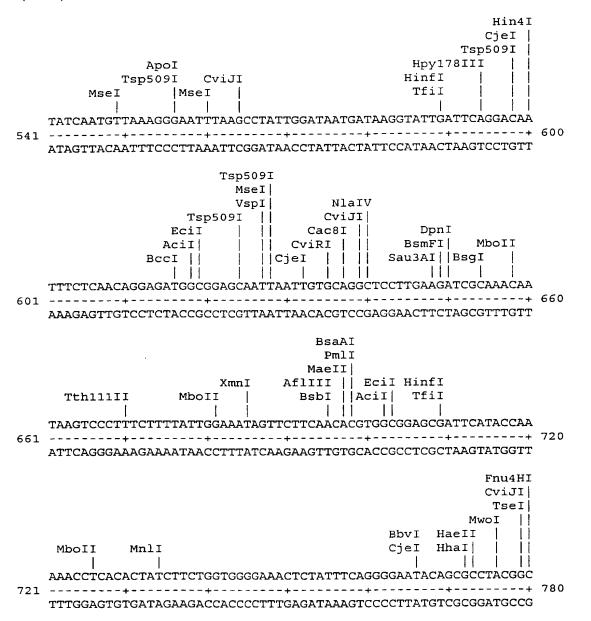
WO 00/24765



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

Fig. 2 (con't)

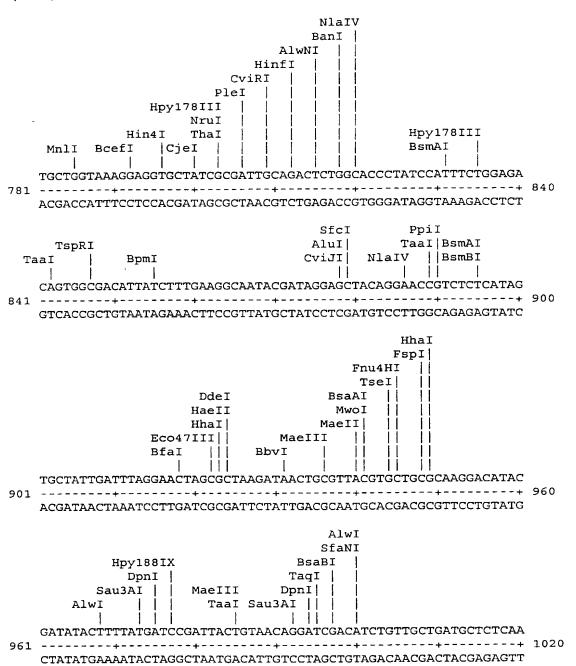


AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

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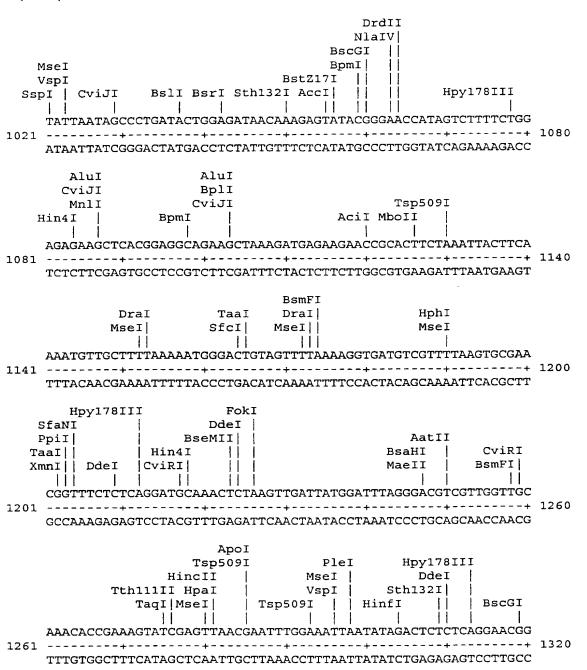
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al

PCT/CA99/00992

· WO 00/24765

Fig. 2 (con't)

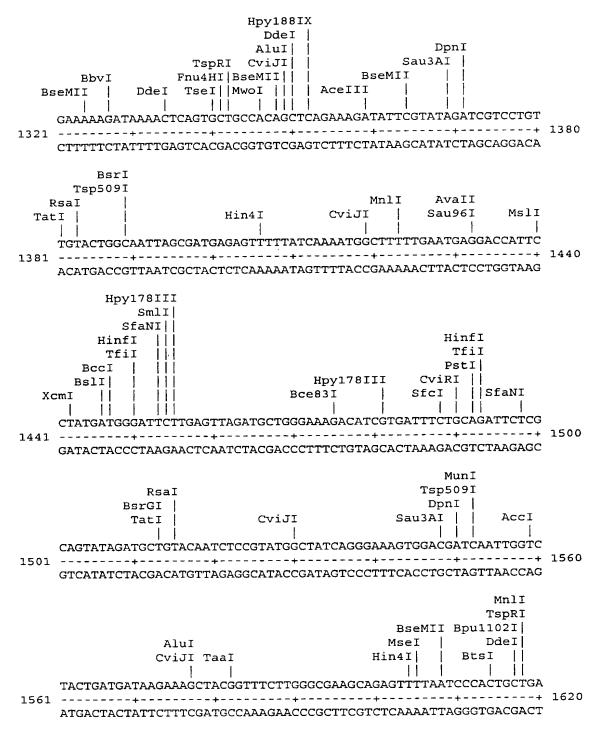


DOCKET NO.: 032931/0251

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PCT/CA99/00992

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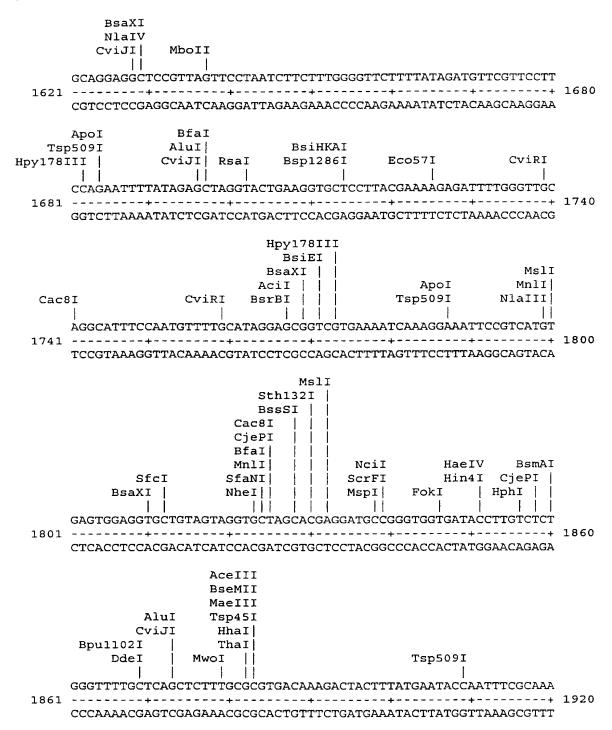


AND USES THEREOF

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

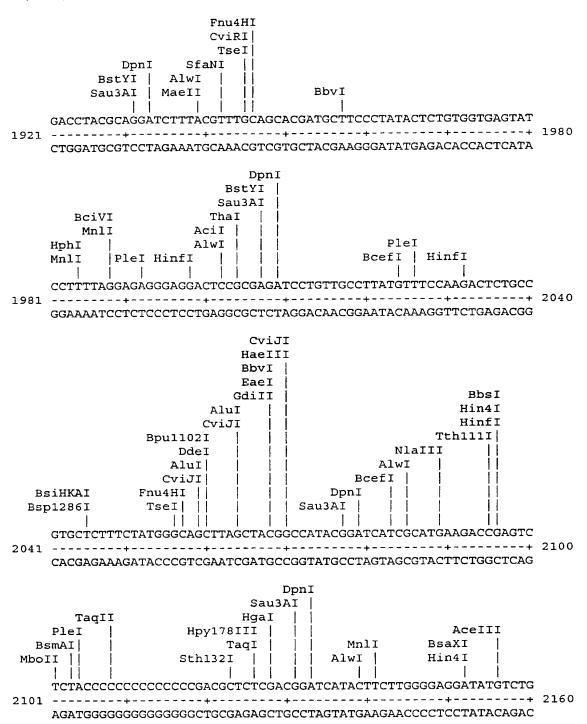


AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

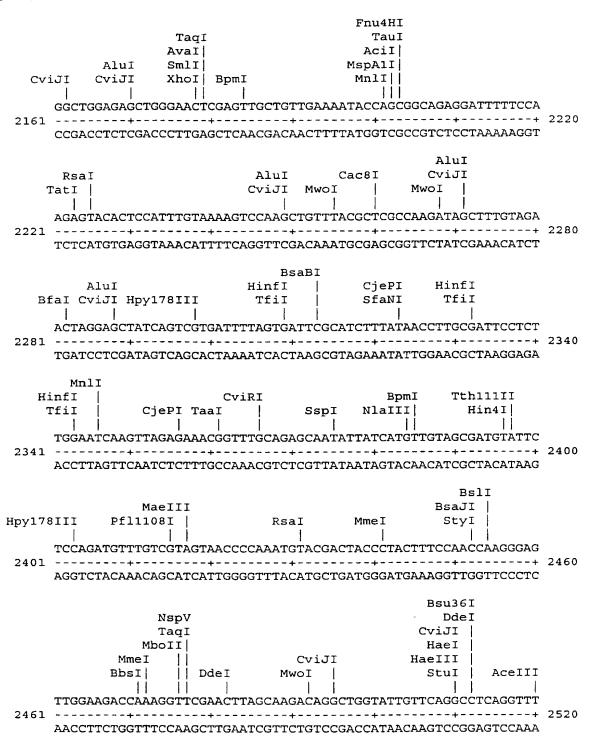
WO 00/24765



AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

WO 00/24765

PCT/CA99/00992



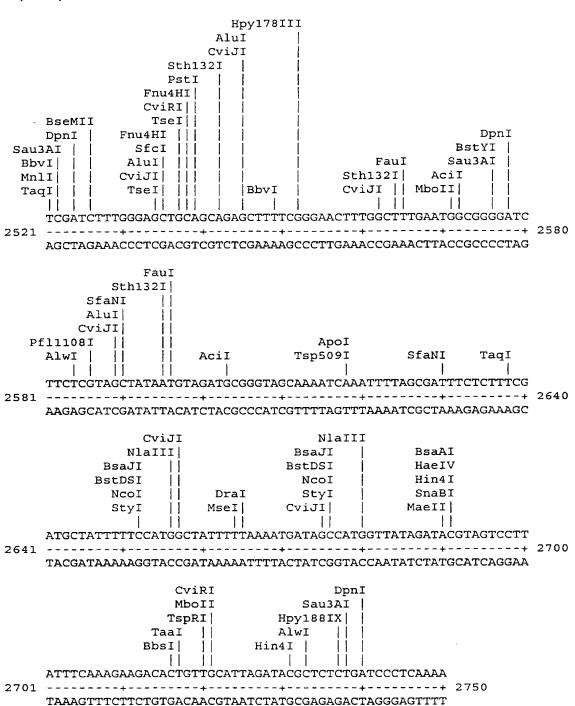
Title: CHLAMYDIA ANTIGENS AND THE TOP 1 8 3 0 4 4 6 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 3: CPN100421												
ctcctgtccc tcgcgttgtc aacctacccc tcctccctcg aattctaatc ctttgaacgt 60												
agtacaacag c	ectgttgctg c	ategteagt ge		atg ccc cca Met Pro Pro 1		115						
gct gat gat Ala Asp Asp	gtt ctc cct Val Leu Pro 10	aga gac cat Arg Asp His	ctg tca Leu Ser 2	gat gga agt Asp Gly Ser	ttc tca Phe Ser 20	163						
gat acg tat Asp Thr Tyr	cca gac att Pro Asp Ile 25	aca acg caa Thr Thr Gln 30	gcg atc Ala Ile	atc tta att Ile Leu Ile 35	ttc ttg Phe Leu	211						
gcc cta tcg Ala Leu Ser 40	cct ttc ctg Pro Phe Leu	gtc atg ttg Val Met Leu 45	ctc act the Leu Thr	tcg tat cta Ser Tyr Leu 50	aag att Lys Ile	259						
atc att act Ile Ile Thr 55	tta gtc tta Leu Val Leu	tta cgt aac Leu Arg Asn 60	gcc tta (gga gta caa Gly Val Gln 65	caa aca Gln Thr	307						
cct ccc agt Pro Pro Ser 70	caa gtc ctc Gln Val Leu 75	aat ggg att Asn Gly Ile	gca ctc a Ala Leu 80	atc cta tct Ile Leu Ser	att tat Ile Tyr 85	355						
gtg atg ttc Val Met Phe	ccc acg gga Pro Thr Gly 90	gtg gct atg Val Ala Met	tat aaa q Tyr Lys 2 95	gat gct cgc Asp Ala Arg	aag gaa Lys Glu 100	403						
		cct caa agc Pro Gln Ser 110				451						
		tta aac aaa Leu Asn Lys 125				499						
ttc tta att Phe Leu Ile 135	Arg Asn Thr	cca aaa gca Pro Lys Ala 140	caa att (Gln Ile (Gln Ser Phe	tac aag Tyr Lys	547						
atc tca cag Ile Ser Gln 150	aaa acc ttc Lys Thr Phe 155	cct tcg gaa Pro Ser Glu	att cga Ile Arg 160	gcg cac ctc Ala His Leu	act gcc Thr Ala 165	595						
tcc gac ttt Ser Asp Phe	gta atc att Val Ile Ile 170	att cct gct Ile Pro Ala	ttt att Phe Ile 175	atg ggt cag Met Gly Gln	ata aaa Ile Lys 180	643						
		gtc ttg atc Val Leu Ile 190				691						

Title: CHLAMYDIA ANTIGENS AND SOME CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 3 (con't)

gat tta gtg act gct aac gtt ctt gta gcg atg cag atg at Asp Leu Val Thr Ala Asn Val Leu Val Ala Met Gln Met Me 200 205 210	ng atg tta et Met Leu	739
tcc cct cta tcg att tcg tta cct tta aag tta ctt ttg at Ser Pro Leu Ser Ile Ser Leu Pro Leu Lys Leu Leu Leu Il 215 220 225		787
gta gac gga tgg aca tta ctg ctc caa ggg ctt atg atc ag Val Asp Gly Trp Thr Leu Leu Gln Gly Leu Met Ile Se 230 235 240	,	835
taaggacacg tgccgtgtta gcatttttcg caactagttt caaatctgtt	ctttttgagt	895
actectacea ateattatta ettattttga ttgtttegge aceteceate	atcttagctt	955
ccatagtcgg gattatggtt gcgatcttcc aagccgcaac acaaa		1000

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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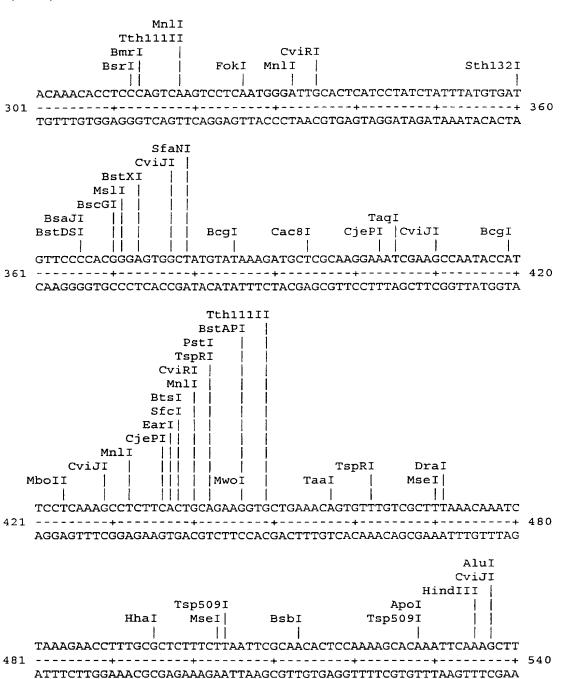
Figure 4 (RY-34) Restriction enzyme analysis of CP100421

	MnlI
	ApoI
	ECORI
BseRI	Tsp509I
HincII	MnlI
ThaI MnlI ! BsaXI	. : :
	111
CTCCTGTCCCTCGCGTTGTCAACCTACCCCTC	CTCCCTCGAATTCTAATCCTTTGAACGT
1	
GAGGACAGGGAGCGCAACAGTTGGATGGGGAG	
OACOACACGCALICACTICOTTICOCOTT	
BbvI CviRI	
RsaI Fnu4HI TspR	I NlaIII BsmI
. ! · · · · · · · · · · · · · · · · · ·	
Tatl CviJI Tsel SfaNI	NspI TspRI
AGTACAACAGCCTGTTGCTGCATCGTCAGTGC	
	120
TCATGTTGTCGGACAACGACGTAGCAGTCACG	GAAGGATGTACGGGGGTGACTTACGACT
	BseMII
Hpy188IX	Hpy178III
AhdI	BsaAI
BfaI HaeIV	BsaBI
BsaI Hin4I	Hpy188IX SnaBI
BsmAI BccI XcmI BccI	DdeI MaeII BciVI
TGATGTTCTCCCTAGAGACCATCTGTCAGATG	GAAGTTTCTCAGATACGTATCCAGACAT
121+	+ 180
ACTACAAGAGGGATCTCTGGTAGACAGTCTAC	CTTCAAAGAGTCTATGCATAGGTCTGTA
DpnI CviJI	
Sau3AI Tsp509I HaeIII	
Cac8I MseI Sau96I	_
cacoi Maci	LEOKII MIGITI
TACAACGCAAGCGATCATCTTAATTTTCTTGG	
181+	
ATGTTGCGTTCGCTAGTAGAATTAAAAGAACC	GGGATAGCGGAAAGGACCAGTACAACGA
	BsaAI
	MaeIII
	SnaBI Bsu36I RsaI
	MaeII DdeI TatI
CACTTCGTATCTAAAGATTATCATTACTTTAG	
241+	300
GTGAAGCATAGATTTCTAATAGTAATGAAATC	AGAATAATGCATTGCGGAATCCTCATGT

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

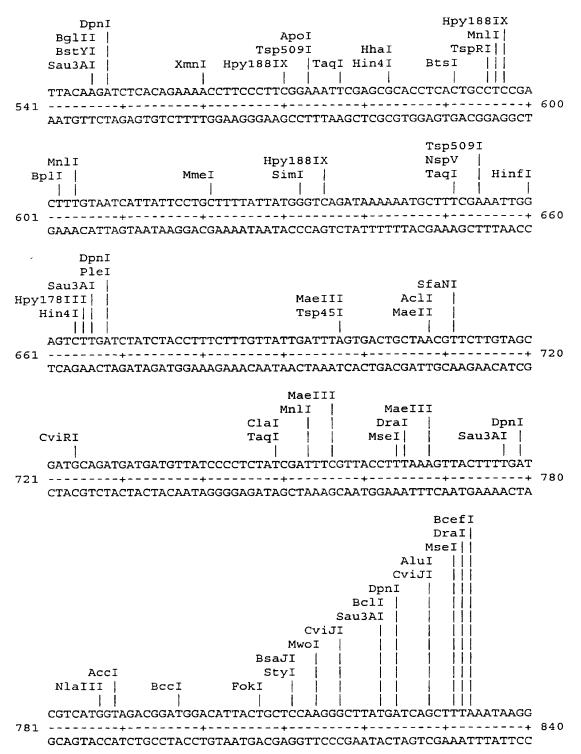
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AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992



CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 4 (con't)



Title: CHLAMYDIA ANTIGENS AND 1 5 09 / 8 3 0 4 4 6 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 5:			,	
tagctttata c	caaagtatag aaaaa	ataaca cgacaataaa	aggagcggtg ttttctcttc	60
tgaggtaaat c	cagootcaaa gatad	ctacgc catagtaaag	atg aag ttt ttt agc Met Lys Phe Phe Ser 1 5	115
tta att ttt Leu Ile Phe	aaa gat gat gat Lys Asp Asp Asp 10	gtc tcc cca aat Val Ser Pro Asn 15	aag aag gtt tta tct Lys Lys Val Leu Ser 20	163
cct gaa gct Pro Glu Ala	ttc tct gct ttc Phe Ser Ala Phe 25	c ctt gat gcc aaa e Leu Asp Ala Lys 30	gag ctg tta gaa aaa Glu Leu Leu Glu Lys 35	211
			aca gaa caa aag tgt Thr Glu Gln Lys Cys 50	259
		a Lys Asp Gln Gly	ttt aaa gag gga tct Phe Lys Glu Gly Ser 65	307
			gaa gaa act aaa aat Glu Glu Thr Lys Asn 85	355
			ctg gca att gcg agt Leu Ala Ile Ala Ser 100	403
gtg agg aaa Val Arg Lys	atc att ggg aag Ile Ile Gly Lys 105	g gaa ctc gaa tta s Glu Leu Glu Leu 110	cat cct gaa act att His Pro Glu Thr Ile 115	451
			aca caa aat aaa cat Thr Gln Asn Lys His 130	499
	Ser Val Asn Pro		ctt gtt gag aaa agt Leu Val Glu Lys Ser 145	547
cgt cct gaa Arg Pro Glu 150	ctc aag aac atc Leu Lys Asn Ile 155	e gtg gag tat gct e Val Glu Tyr Ala 160	gac tcc tta att ctt Asp Ser Leu Ile Leu 165	595
			att atc gag act gaa Ile Ile Glu Thr Glu 180	643
			tta gat gcc tta gaa Leu Asp Ala Leu Glu 195	691

Title: CHLAMYDIA ANTIGENS AND THE 109 1830 446 CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew P. MUDDING

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

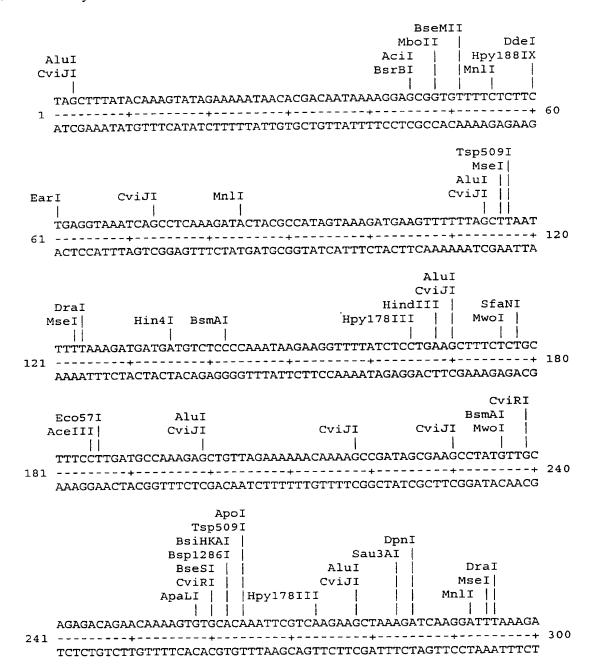
														gag Glu		739
														gat Asp		787
_	_	aaa Lys		taaa	aggta	att o	acta	attat	g cg	gatco	catt	tto	gati	tttc		839
cctt	tgtt	tt t	ttac	gcts	ga go	gtct	cato	gctg	gattt	gct	gac	gccaç	gtc 1	atat	gaaaa	899
_																900

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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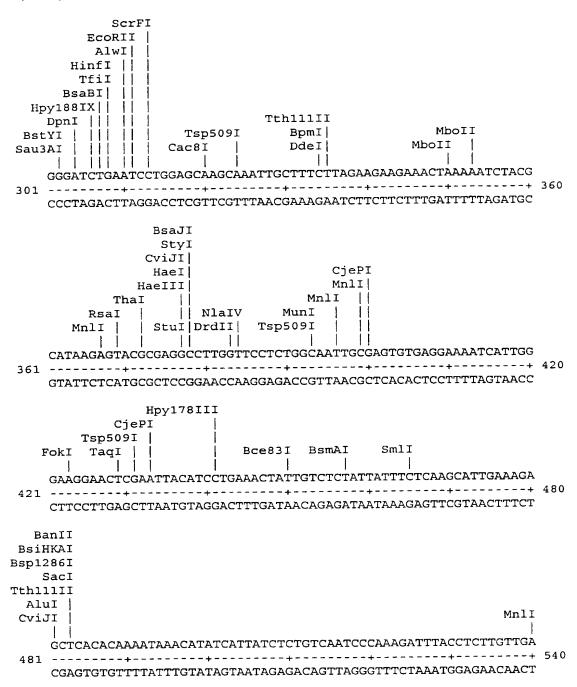
Figure 6 (RY-35)
Restriction analysis of CPN100422



AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

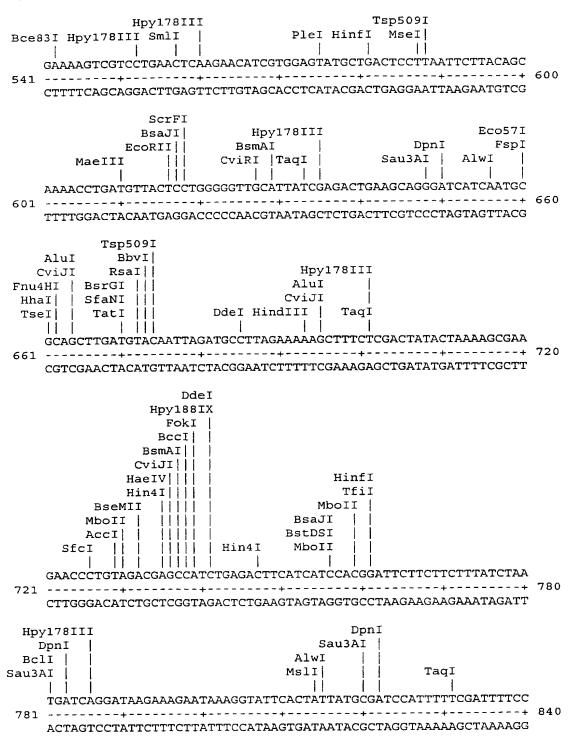


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AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

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Fig. 6 (con't)



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

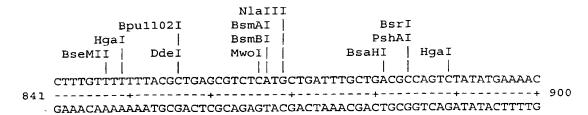
AND USES THEREOF

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 6 (con't)



THE POLYNON

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 7: CPN 100424

		•			
tgttcgcgat tggc	actaat cccccct	ttt gttatggtga	ataaaaaggt	atgcgtggat	60
tatggttcgt cgat	ctattt ctttttg	gett gttettteta	atg aca ttg Met Thr Leu 1		115
tgt aca agc tgt Cys Thr Ser Cys	aac agc agg t Asn Ser Arg S 10	ct cta att gtg Ser Leu Ile Val 15	cac ggt ctt His Gly Leu	cct ggc Pro Gly 20	163
aga gaa gcg aat Arg Glu Ala Asn 25	Glu Ile Val V	gtg ctt ttg gta Val Leu Leu Val 30	agc aaa ggg Ser Lys Gly 35	gtg gct Val Ala	211
gca caa aaa ttg Ala Gln Lys Leu 40					259
gag caa atg tgg Glu Gln Met Trp 55					307
ctt gcc att cta Leu Ala Ile Leu 70			_	_	355
ctg tta gat ctt Leu Leu Asp Leu					403
gaa aaa atc cgt Glu Lys Ile Arg 105	Tyr Gln Glu G	-		_	451
att aga aaa atg Ile Arg Lys Met 120	Asp Gly Val V				499
act aca gaa aat Thr Thr Glu Asn 135					547
aag cat cga ggg Lys His Arg Gly 150					595
att aag cgc ctt Ile Lys Arg Leu				J	643
gtc tct gta gtg Val Ser Val Val 185	Ser Asp Arg A				691

Title: CHLAMYDIA ANTIGENS AND TO 1830446 CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): And the Property of the Pro

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig	7	(con't)
ı ıy.	•	(COII C)

													gtt Val			739
													att Ile			787
													ctt Leu			835
													aca Thr			883
								_		_	_	_	gcc Ala 275	_		931
-			_										gca Ala			979
_		_	_				_		_	_		-	tct Ser	_	-	1027
	_	_		_		_		_		gag Glu 320		_	tagt	gact	:gc	1076
caad	cactt	tt ç	ggaad	eteta	ag ac	catct	tgat	gaa	agcad	ctcc	aagg	gaaga	atg a	accto	tccag	1136
gttt	ctto	ect a	aaaa	atctt	c tt	gttg	gaato	tco	tcat	ccc	gaag	gaaat	cc c	ttta	aaatc	1196
ttta	a															1200

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

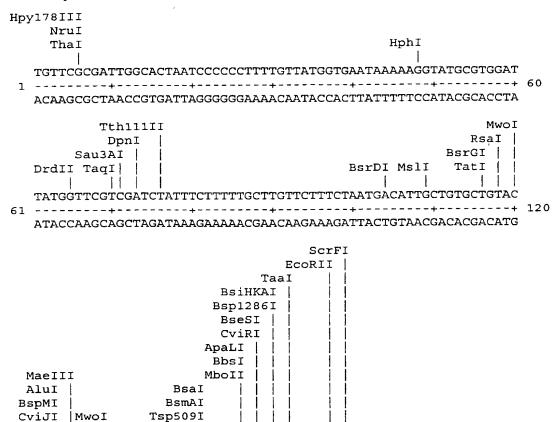
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Figure 8 (RY-36)

WO 00/24765

Restriction analysis of CPN100424

1 1 1



121 -----+ 180 ${\tt TTCGACATTGTCGTCCAGAGATTAACACGTGCCAGAAGGACCGTCTCTTCGCTTACTCTA}$

AAGCTGTAACAGCAGGTCTCTAATTGTGCACGGTCTTCCTGGCAGAAAGCGAATGAGAT

DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

Fig. 8 (con't)

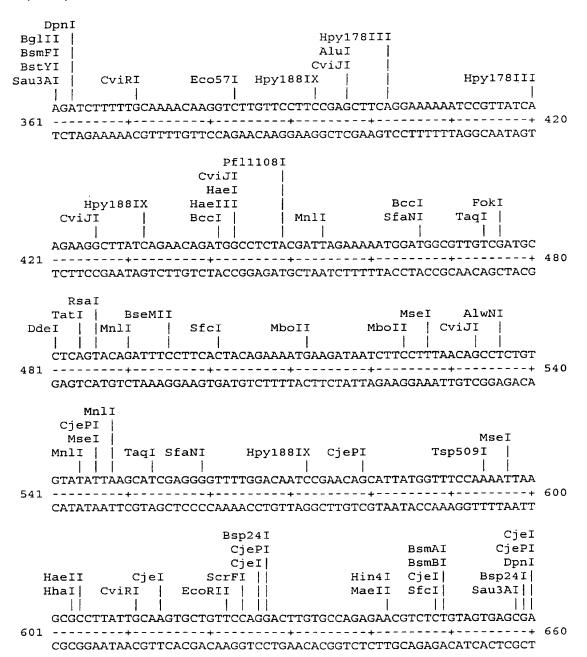
BbvI BsgI	Tsp509I CviRI Bce83I Fnu4HI CviJI TseI BbvI	-+	240
DdeI			
AlwNI	Acil Thal ECORV CAAATGTGGGATATCG	Mnli Mnli CGGTTCCGTCAGCACAAATCAC	300
AIGICGGCCICGICGAIGACICC			
CviJI Bbs: HaeIII Bbs: CjePI MboI: Eco0109I FauI Sau96I Sth132I AGAGGCCCTTGCCATTCTAAATC	I	CviJI 	
301		-++ CATACTTTCCCTGTTCGGACAA	360

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 8 (con't)



AND USES THEREOF

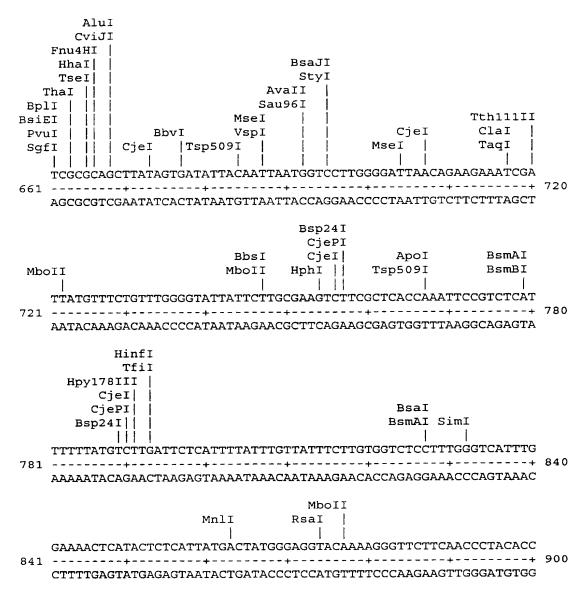
Inventor(s): Andrew D. MURDIN et al

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992





Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 097830446

PCT/CA99/00992

Fig. 8 (con't)

	AlwNI Fnu4HI AluI AluI CviJI MspAlI BsaJI PvuII CviJI TseI BsmI BbvI Fnu4HI BsaJI CviJI MwoI TseI SfaNI StyI MwoI MnlI MwoI BbvI ATATACAAAGAATGCCTTGGAAGCCAAGAAAGCAAA	
901	TATATGTTTCTTACGGAACCTTCGGTTCTTTCGGCTCCCTCGTCGACGACTGTTTCTCTT	960
	Mboli Hinfl Hinfl Hin4l Tfil TspRl Bfal CviRl Acil Bsrl Plel Bpml AAAAGAAGATGCAGATTCACAGGGGGAAAGCAAAAATGCGGAAACCAGTGATAAAGACTC	
961	TTTTCTTCTACGTCTAAGTGTCCCCCTTTCGTTTTTACGCCTTTGGTCACTATTCTGAG	1020
Sfal	BsrDI Maelli Tsp5091 Tsp451 NI Hpy178III Mnll Ddel BsbI	
1021		1080
1081	ScrFI Hpy178III EcoRII Hpy178III BpmI HgiEII BfaI BsaJI Hin4I XbaI MslI StyI CjePI MboII MnlI	1140
I	TGAAAACCTTGAGATCTGTAGAACTACTTCGTGAGGTTCCTTCTACTGGAGAGGTCCAAA HinfI CjePI Sth132I DraI BseRI MnlI MboII MboII FokI TfiI Hpy178III MseI	
1141	CTTCCTAAAAATCTTCTTGTTGAATCTCCTCATCCCGAAGAAATCCCTTTAAAATCTTTA	1200

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

Figure 9: CPN100426

rigule 9: C.	PN100420			
ttgaacccta tgg	gaaatgta totta	tttgt gctgggctat	atttcttaat gac	aacatca 60
ttttcctgta ttt	ctaggtt atcag	aaaag agaaggagtt	atg aca att ag Met Thr Ile Ar	a gtc 115 g Val 5
cga aac ctt go Arg Asn Leu Al	cc tac tct gta la Tyr Ser Val 10	aat aag aaa aag Asn Lys Lys Lys 15	att cta gat gg Ile Leu Asp Gl	y Val
Thr Phe Ser Le	ca gag cga ggg eu Glu Arg Gly 25	cac att aca ctg His Ile Thr Leu 30	ttt gtt ggg aa Phe Val Gly Ly 35	g agt 211 s Ser
ggt tca gga aa Gly Ser Gly Ly 40	aa aca atg att /s Thr Met Ile	tta cgt gct ttg Leu Arg Ala Leu 45	gcg ggc tta gt Ala Gly Leu Va 50	c cag 259 l Gln
ccc act caa gg Pro Thr Gln Gl 55	ga gat att tgg ly Asp Ile Trp 60	att gaa ggg gag Ile Glu Gly Glu	gct cca gct ct Ala Pro Ala Le 65	a gtt 307 u Val
		tcc cat atg aca Ser His Met Thr 80	Val Leu Gly As:	
		aag ggt cgt agt Lys Gly Arg Ser 95		a Arg
	ne Glu Leu Leu	cat ttg ttg gat His Leu Leu Asp 110		
aag aat tat co Lys Asn Tyr Pi 120	ct gac cag ctc ro Asp Gln Leu	tct ggg gga caa Ser Gly Gly Gln 125	aaa caa cgt gt Lys Gln Arg Va 130	g gct 499 l Ala
		gat aaa cat aca Asp Lys His Thr		
cct aca tcg go Pro Thr Ser A 150	ct tta gat cct la Leu Asp Pro 155	ttt gct acg gca Phe Ala Thr Ala 160	Ser Phe Arg Hi	t ctt 595 s Leu 165
tta gaa aca c Leu Glu Thr Le	tt cga gac cag eu Arg Asp Gln 170	gaa ctg act gta Glu Leu Thr Val 175	ggg tta act ac Gly Leu Thr Th 18	r His
Asp Met Gln Pl	tt gtt cat agt he Val His Ser 85	tgt ttg gat cgt Cys Leu Asp Arg 190	atc tat ctt at Ile Tyr Leu Il 195	a gat 691 e Asp

35/165

Title: CHLAMYDIA ANTIGENS AND

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

Fig. 9 (con't)

caa Gln	gga Gly	act Thr 200	gtt Val	gcg Ala	gly ggg	gtc Val	tat Tyr 205	gac Asp	aag Lys	cgt Arg	gac Asp	gga Gly 210	gag Glu	ctc Leu	gat Asp	739
									cac His				tag	gacta	aca	788
gct	gctag	gag d	cagct	gtag	gt ga	atact	ttag	g aat	cct	gacc	agt	ggcag	gga a	atgag	geggea	848
tg																850

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CORRESPONDING DNA FRAGMENTS
AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 10 (RY-37) Restriction enzyme analysis of CPN100426

	CviJI MseI	
	TTGAACCCTATGGAAATGTATCTTATTTGTGCTGGGCTATATTTCTTAATGACAACATCA	
1	AACTTGGGATACCTTTACATAGAATAAACACGACCCGATATAAAGAATTACTGTTGTAGT	60
61	Hpy188IX Bfal Hpy188IX Tsp509I Hinfl PleI TTTTCCTGTATTTCTAGGTTATCAGAAAAGAGAAGGGAGTTATGACAATTAGAGTCCGAAA	120
0.1	AAAAGGACATAAAGATCCAATAGTCTTTTCTCTTCCTCAATACTGTTAATCTCAGGCTTT	
	Hpy178III BfaI XbaI	
	HinfI MaeIII MnlI CjePI TfiI BccI CjePI 	
121	CCTTGCCTACTCTGTAAATAAGAAAAGATTCTAGATGGTGTAACTTTTTCTTTAGAGCG + GGAACGGATGAGACATTTATTCTTTTCTAAGATCTACCACATTGAAAAAGAAATCTCGC	180
Ttl	Sp1286I Hpy178III FauI n111II EarI MboII Sth132I BmgI TspRI DrdII BsaAI BseSI TaaI AloI CjeI MaeII	
181	AGGGCACATTACACTGTTTGTTGGGAAGAGTGGTTCAGGAAAAACAATGATTTTACGTGC+ TCCCGTGTAATGTGACAAACAACCCTTCTCACCAAGTCCTTTTTGTTACTAAAATGCACG	240
	Ddel	
241	AAACCGCCCGAATCAGGTCGGGTGAGTTCCTCTATAAACCTAACTTCCCCTCCGAGGTCG	300
Bi	Sth132I CjeI MmeI Tsp509I fal Acelli Aval Ndel Taal Fokl CviRl Bccl	
301	TCTAGTTTTCCAACAACCCGAGTTATTTTCCCATATGACAGTATTAGGAAATTGCACCCA AGATCAAAAGGGTTGTTGGGCTCAATAAAAGGGTATACTGTCATAATCCTTTAACGTGGGT	360

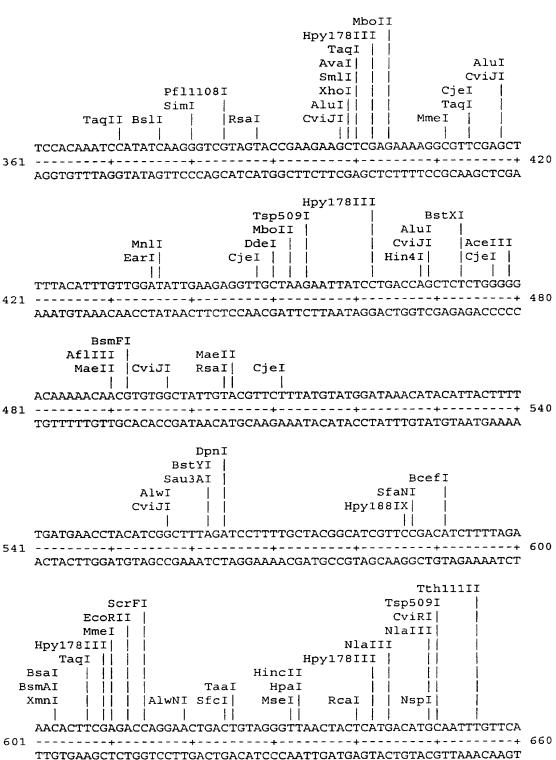
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS 09/830446 AND USES THEREOF

PCT/CA99/00992

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

Fig. 10 (con't)



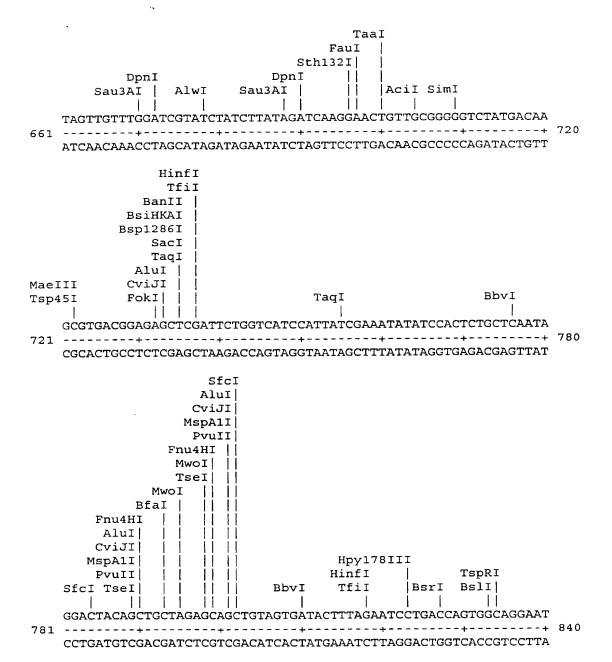
09/830446

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 10 (con't)



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 10 (con't)

WO 00/24765

Fnu4HI
TauI
AciI|
BsrBI|NlaIII
| | |
GAGCGGCATG
841 ----+ 850
CTCGCCGTAC

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Fig	gure	11	:	C	PN1	9050	8									
ctc	tgat	tta	tggt	aatt	ct t	tatt	ttca	g ag	ccgt	caag	tcc	tttc	tat	tctg	rttgaat	60
ttc	ctaa	taa	cgta	agta	at a	aaca	atca	a aa	gtcc	gcat		Lys			ttt Phe 5	115
					atc Ile						_	_	_		Ser	163
					tct Ser									Ala		211
Val	Val	His	Ala Ala	Asp	Ser	Gly	Lys	Val	Phe	Tyr	Asp	Lvs	Asp Asp	Ile	gat Asp Asp	259
Ala	Val	Ile	Tyr	Pro	gcc Ala Ala	Ser	Met	Thr	Lys	Ile	Ala	Thr	Ala	Leu	Phe	307
Ile	Leu Leu	Lys	His	Tyr	Pro Pro 75	Thr	Val	Leu	Asp	Thr	Leu	Ile	Lvs	Val	Lvs	355
Gln	Asp	Ala	Ile	Ala	tcc Ser Ser	Ile	Thr	Pro	Gln	Ala	Lys	Lys	Gln	Ser	Ğİv	403
Tyr	Arg	Ser	Pro	Pro	cac His His	Trp	Leu	Glu	Thr	Asp	Gly	Ser	Thr	Ile	Gln	451
Leu	His	Leu	Ara	Glu	gag Glu Glu	Leu	Leu	Glv	Tro	Asp	Leu	Phe	His	Ala	T.en	499
Leu	Val	Cys	Ser	Ala	aat Asn Asn	Asp	Ala	Ala	Asn	Val	Leu	Ala	Met	Ala	Cvs	547
Cys	Gly	Ser	Val	Glu	aag Lys Lys 155	Phe	Met	Asp	Lys	Leu	Asn	Phe	Phe	Leu	Lvs	595
Glu	Glu	Ile	Gly	Cys	act Thr Thr	His	Thr	His	Phe	Asn	Asn	Pro	His	Giv	Leu	643

Title: CHLAMYDIA ANTIGENS AND STATES 097830446 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 11 (con't)

His	His	Pro	Asn	His	tat Tyr Tyr	Thr	Thr	Thr	Arg	Asp	Leu	Ile	Ser	Ile Ile	Met	691
Arg	Cys	Ala	Leu	Lys	gaa Glu Glu	Pro	Pro	Phe	Arg	Gly	Val	Ile	Ser Ser	Thr	Thr	739
Ser	Tyr	Lys	Ile	Gly	gct Ala Ala	Thr	Asn	Leu	His	Gly	Glu	Arg	Ile	Leu	Ser	787
Pro	Thr	Asn	Lys	Leu	ctt Leu Leu 235	Leu	Pro	Gly	Ser	Thr	Tyr	His	Tyr	Pro	Pro	835
Ala	Leu	Gly	Gly	Lys	aca Thr Thr	Gly	Thr	Thr	Lys	Thr	Ala	Gly	Lys	Asn	Leu	883
Ile	Met	Ala	Ala	Glu	aaa Lys Lys	Asn	Asn	Arg	Leu	Leu	Val	Thr	Ile	Āla	Thr	931
Gly		Ser	Gly	Pro	gtg Val											979
tgt Cys	gaa Glu 295	acg Thr	gta Val	ttt Phe	aac Asn	gag Glu 300	ecg Pro	cta Leu	tta Leu	aga Arg	aaa Lys 305	gag Glu	ctc Leu	gtc Val	ecc Pro	1027
ccc Pro 310	tcc Ser	gac Asp	tgt Cys	ctc Leu	caa Gln 315	tta Leu	gaa Glu	ata Ile	gcg Ala	aat Asn 320	ctt Leu	Gly ggg	aag Lys	ctt Leu	tct Ser 325	1075
tgc Cys	cct Pro	ctt Leu	cct Pro	gag Glu 330	gga Gly	ctc Leu	tac Tyr	Tyr	gac Asp 335	ttc Phe	tat Tyr	gcc Ala	tcc Ser	gaa Glu 340	gat Asp	1123
ege Arg	gaa Glu	cct Pro	ctt Leu 345	tct Ser	gta Val	tct Ser	₽he	att Ile 350	gca Ala	cat His	gcg Ala	gac Asp	gcc Ala 355	ttc Phe	cct Pro	1171
att Ile	gaa Glu	caa Gln 360	gga Gly	gat Asp	cit Leu	ctt Leu	ggt Gly 365	cat Hıs	tgg Trp	gtt Val	Phe	tat Tyr 370	gac Asp	gat Asp	gaa Glu	1219

1000 RSA Section Contra

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

Fig. 11 (con't)

												tgt Cys			gag Glu	1267
												gtc Val			tcg Ser 405	1315
tat Tyr	aga Arg	acc Thr	tat Tyr	atg Met 410	tct Ser	ata Ile	acc Thr	atg Met	ctg Leu 415	ctc Leu	atg Met	tat Tyr	ttt Phe	cgc Arg 420	atc Ile	1363
												tct Ser				1408
taad	tttt	tc t	ttta	attt	a ta	ıaaaa	acca	aag	gttt	atg	taag	attt	gc g	rcttt	tcaat	1468
ccaa	caag	aa t	ccct	tgtg	ge ge	acat	tact	tt								1500

AND USES THEREOF

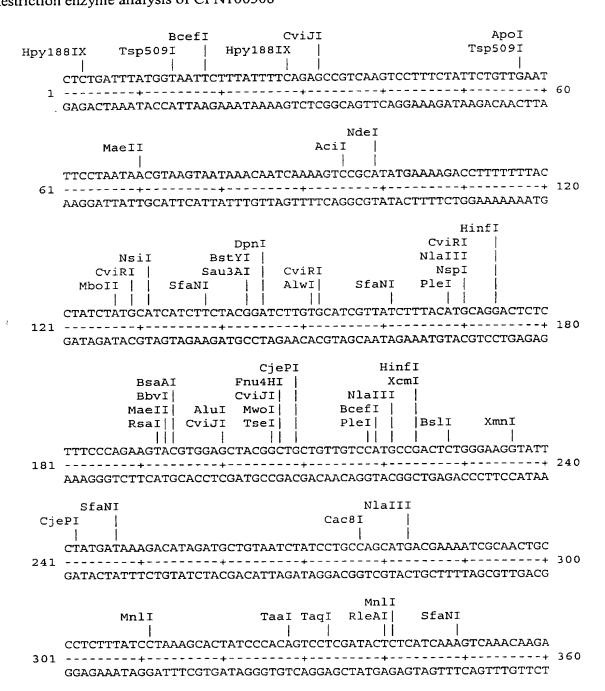
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

097830446

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WO 00/24765

Figure 12 (RY-39)
Restriction enzyme analysis of CPN100508



CORRESPONDING DNA FRAGMENTS AND USES THEREOF 09/83044

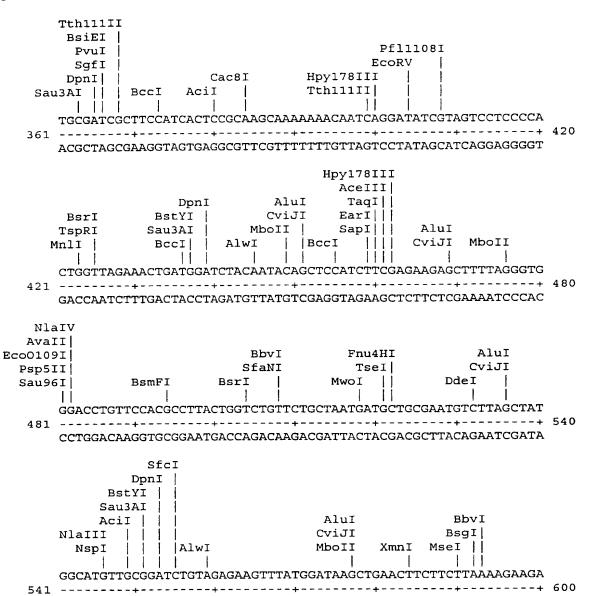
WO 00/24765

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 12 (con't)

THE STATE OF



CCGTACAACGCCTAGACATCTCTTCAAATACCTATTCGACTTGAAGAAGAATTTTCTTCT

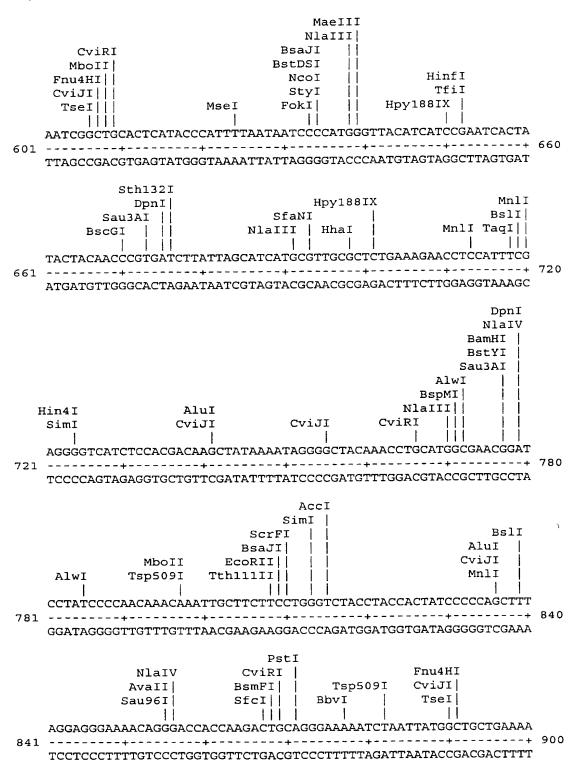
CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

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WO 00/24765

Fig. 12 (con't)

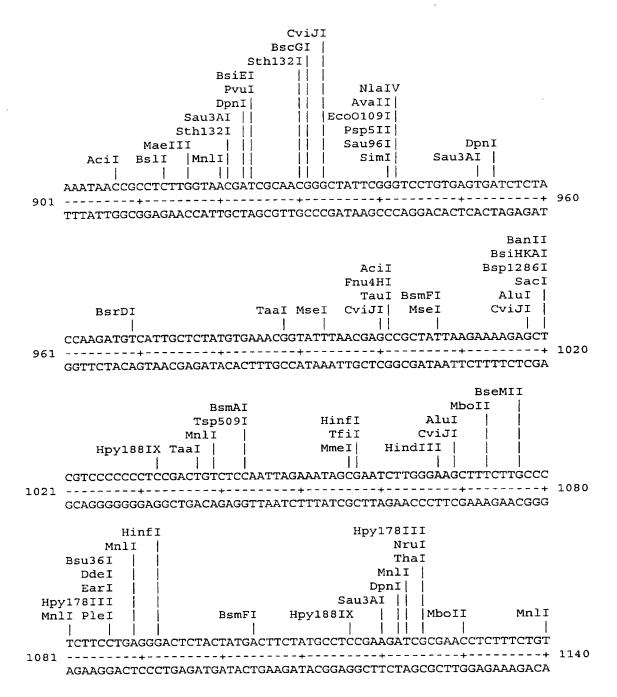


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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 12 (con't)

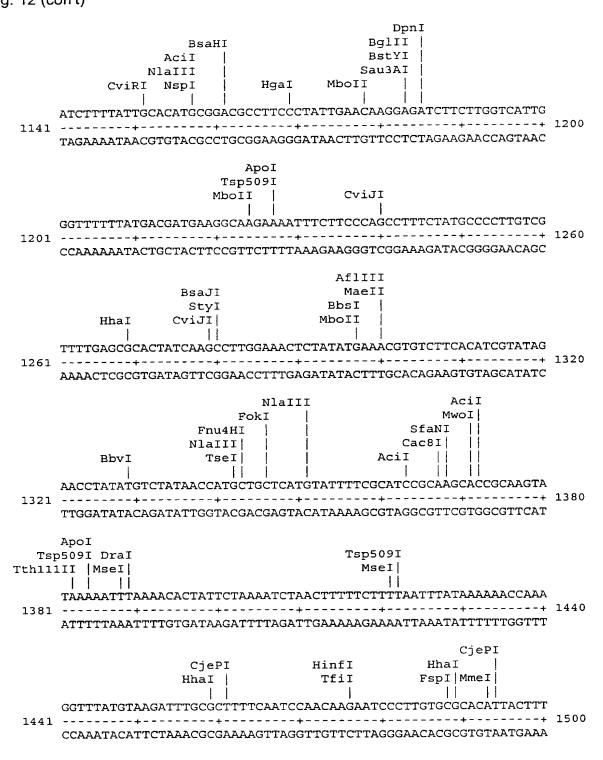


CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 12 (con't)



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 09/830446

PCT/CA99/00992

WO 00/24765

Figure 13: CPN100515 -

aag	gagc	aaa	tgga	gatt	gg c	caaa	taga	c ga	gcaa	ıgggt	ttg	cata	ıaga	ataç	rccttt	60
tcg	caat	aat	aact	tgcc	ta a	acga	tctt	g ta	aacg	actt		Ala			ccc Pro 5	115
Ile	Leu	Gln	Ile	Glu	Asp	Leu	Ser	Ile	Thr	Leu Leu	Ala	Lys	Gln	Arg	Gln Gln	163
Gln	Tyr	Pro	Ile	Val	Gln	Ser	Leu	Ser	Phe	Thr	Ile	Asn	Glu	gga Gly Gly	Gln	211
Thr	Leu	Ala	Ile	Ile	Gly	Glu	Ser	Gly	Ser	Gly	Lys	Ser	Val	tct Ser Ser	Ālā	259
His	Ala	Ile	Leu	Arg	Leu	Leu	Pro	Cys	Pro	Pro	Phe	Ser	Val	tct Ser Ser	ĞÎy	307
Gln	Val	Asn	Phe	Gln	Gly	His	Asn	Leu	Leu	Thr	Ala	Ser	Arg	tct Ser Ser	Ile	355
Gln	Lys	Lys	Ile	Ile	Gly	Thr	Glu	Ile	Ser	Met	Ile	Phe	Gln	aac Asn Asn 100	Pro	403
Gln	Ala	Ser	Leu	Asn	Pro	Val	Phe	Thr	Ile	Glu	Gln	Gln	Phe	cga Arg Arg	Ğlu	451
Ile	Ile	His	Thr	His	Leu	Ala	Leu	Thr	Ala	Glu	Val	Āla	Lys	gaa Glu Glu	Lys	499
Met	Leu	Tyr	Ala	Leu	Glu	Glu	Thr	Gly	Phe	His	Asp	Pro	Arg	ctg Leu Leu	Cys	547
Leu	Asn	Leu	Tyr	Pro	Hls	Gln	Leu	Ser	Gly	Gly	Met	Leu	Gln	aga Arg Arg	Ile	595

097830446

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 13 (con't)

Cvs Ile Al	cc atg gcg cto la Met Ala Leo la Met Ala Leo 170	ı Leu Cys S	er Pro Lys	Leu Leu Ile	Ala Asp
GIU PIO IN	g act gct tta ir Thr Ala Leu ir Thr Ala Leu 185	LASD VAL SA	er Val Gln er Val Gln	Tree / 7 - TI	
ned fed for	a aca cta cag s Thr Leu Gln s Thr Leu Gln 0	LVS LVS Tr	IT GIV MAT	Car I am I am	T 1 - 1
	t atg gga gtc n Met Gly Val n Met Gly Val	Agt Wid Pi	u Thr Ala A	1 - 1 - 1 A - 1 A	· . •• •
	a gga cgc atg a Gly Arg Met a Gly Arg Met 235	var Gill LV	5 412 070 1	11 2 17 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	<u></u>
***** **** ***	tet cat ccc Ser His Pro Ser His Pro 250	IVE FOR ARC	T ACD FOURT	eu Ala Ser A eu Ala Ser A	
Der nen GTH	ccg caa caa Pro Gln Gln Pro Gln Gln 265	Leu Giv Set	Phe Asn P: Phe Asn P:	wa Tla D ~	,
	tac acg gcc Tyr Thr Ala Tyr Thr Ala	rne rro ser	'Glu Cue Na	mar 17 - m	_ `
032 267 HAZ	att tta aat Ile Leu Asn Ile Leu Asn	AFG CVS See	$\Delta I \supset C I \mapsto \lambda I$	a Pro Glu Il a Pro Glu Il	
Pro Val Arg	gaa ggt cac a Glu Gly His 1 Glu Gly His 1 315	Lys Val Arg	Val Gly Cy Val Gly Cy 320	s Met Thr Th s Met Thr Th	r Asn r Asn 325
	CCt tta att of Pro Leu Ile of 330				r Tyr r Tyr

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 13 (con't)

Fig.	13 (0	cont)													
T 1/6	A	Sor	ttt Phe Phe 345	Tro	Phe	Gln	Glv	Lvs	Thr	Ile	Ala	Ser	Ara	Pro	Val	1171
Asn	Asn	٧a١	tct Ser Ser	Phe	Ser	Leu	Tyr	Ser	Arq	Arq	Ala	Val	Gly	Leu	Ile	1219
Gly Gly	Glu Glu 375	Ser Ser	gga Gly Gly	Ser Ser	Gly Gly	Lys 380	Ser	Thr	Leu Leu	Ala	Leu Leu 385	Ala Ala	Leu Leu	Ala	Gly Gly	1267
T 0.1	T 011	Pro	ctc Leu Leu	Thr	Ser	Glv	Phe	Leu	Thr	Phe	Asn	Giy	Thr	Pro	11e	1315
T	TOU	Uic	tct Ser Ser	T.vs	His	Glv	Ara	His	Gln	Leu	Arq	Ser	Gin	٧aı	Arg	1363
Tan	Val	Dhe	caa Gln Gln 425	Asn	Pro	Gln	Ala	Ser	Leu	Asn	Pro	Arg	Lys	Thr	I⊥e	1411
Tan	Acn	Sar	tta Leu Leu	Glv	His	Ser	Leu	Leu	Tyr	His	Lvs	Leu	Val	Pro	Lys	1459
Glu	Tire	T/al	cta Leu Leu	Ala	Thr	Val	Ara	Glu	Tvr	Leu	Glu	Leu	Val	Gly	Leu	1507
Sar	G111	Glu	tat Tyr Tyr	Phe	Tvr	Arg	Tyr	Pro	His	Gln	Leu	Ser	GLy	Gly	Gin	1555
Gln	Gln	Ara	gtc Val Val	Ser	Ile	Ala	Arg	Ala	Leu	Leu	Gly	Val	Pro	Gin	Leu	1603
TIA	Tle	Cvs	gac Asp Asp 505	Glu	Ile	Val	Ser	Ala	Leu	Asp	Leu	Ser	Ile	Gln	Ala	1651
Gln	Tle	Leu	aat Asn Asn	Met	Leu	Ala	Glu	Leu Leu	Gln	Lys	Lys	Leu	Ser	Leu	Thr	1699

THUSSEN TY

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 097830446

PCT/CA99/00992

Fig. 13 (con't)

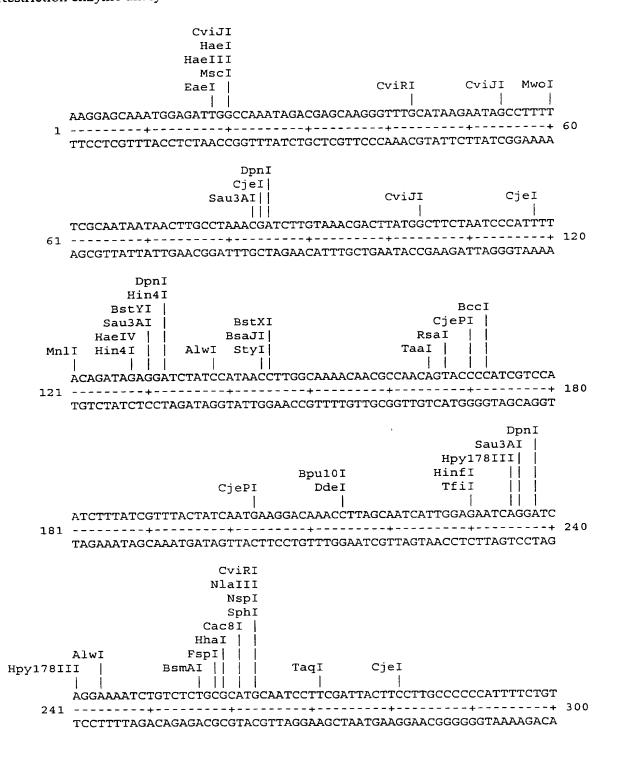
Tyr	Leu	Phe Phe	Ile	Ser	His	Asp	Leu Leu	Ala	va.	l Val	LArq	Ser Ser	Phe	Cvs	aca Thr Thr	1747
Glu	ı Val ı Val	Phe	Ile	Met	Tyr	Lys Lys	Gly	Glr	Ile	e Val	. Glu . Glu	Lys	Gly	Asn	aca Thr Thr 565	1795
Lys	Arg	Ile	Phe	Ser	Asp Asp	Pro	caa Gln Gln	His	Pro	Tyr Tyr	Thr	Arg	Met	Leu	Leu	1843
Asn	Ala	Gln	Leu	Pro	Glu	Thr	cct Pro Pro	qz.K	Glr	Arg	Gln	Ser	aaa Lys 595	cct Pro	ata Ile	1891
ttc Phe	caa Gln	gaa Glu 600	tat Tyr	cac His	aaa Lys	gat Asp	tct Ser 605	gaa Glu	gaa Glu	tct Ser	tgc Cys	tct Ser 610	aca Thr	gga Gly	tgc Cys	1939
tac Tyr	ttt Phe 615	tac Tyr	aat Asn	cgt Arg	tgt Cys	cca Pro 620	caa Gln	aaa Lys	caa Gln	gaa Glu	gct Ala 625	tgc Cys	aag Lys	tca Ser	gag Glu	1987
630	ire	Pro .	ASN	GID	635	Asp	gcg Ala	His	His	Thr 640	Tyr	Arg	Cys	Ile	His 645	2035
tgattegtee tetacgetat tettaageta ecattaagga ateccaaggg agaggtetge										2095						
tcta	t															2100

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 14 (RY-40)
Restriction enzyme analysis of CPN 100515



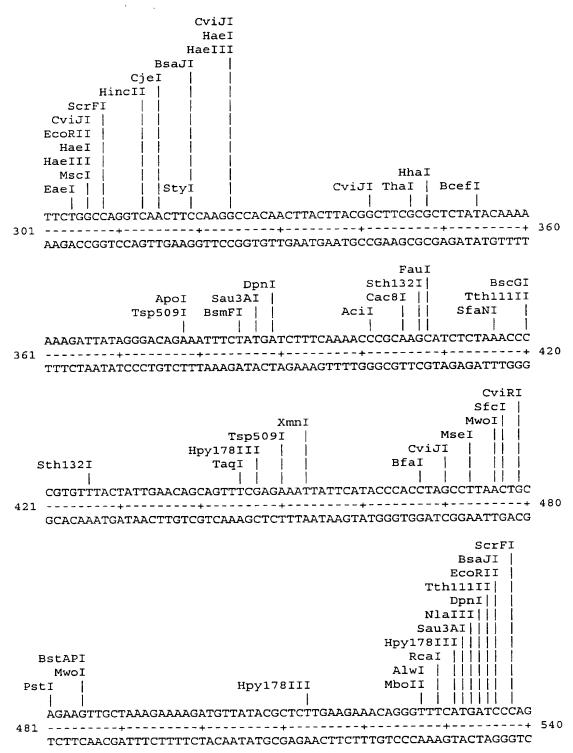
09/83044

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 14 (con't)

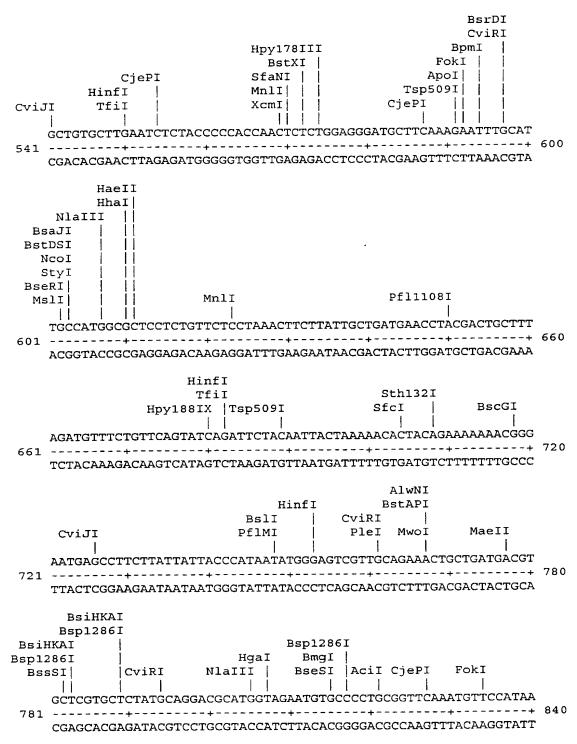


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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 14 (con't)



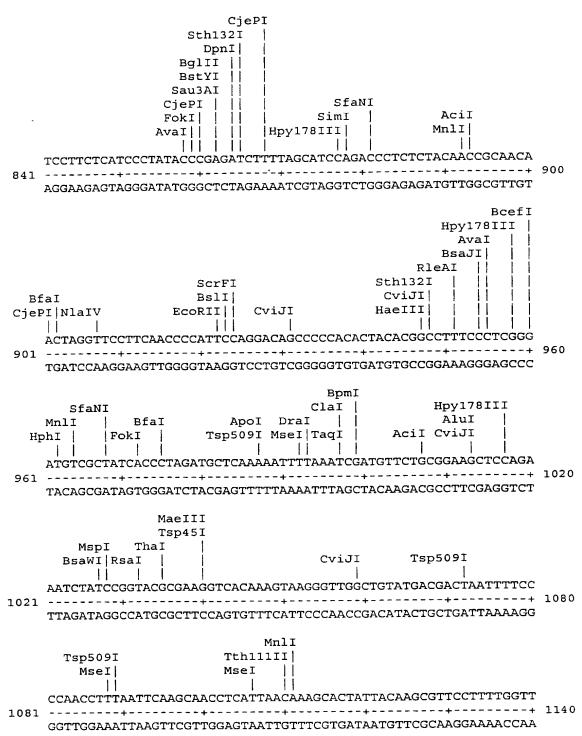
AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

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Fig. 14 (con't)



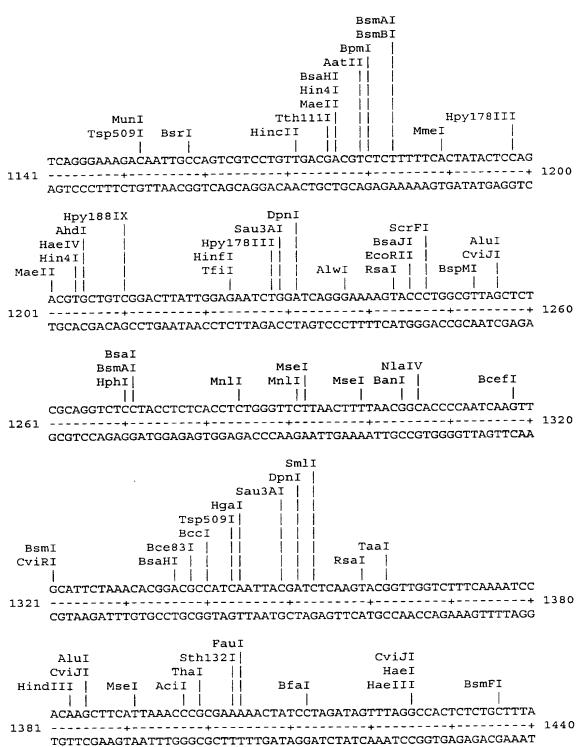
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AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 14 (con't)

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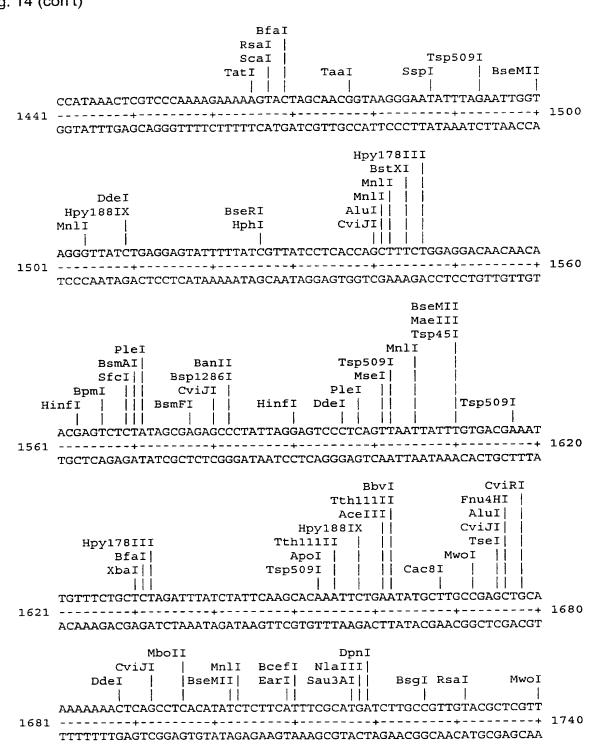


CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 097830446

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Fig. 14 (con't)



CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al PCT/CA99/00992 DOCKET NO.: 032931/0251

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Fig. 14 (con't) CviRI MnlI | Tsp509I | | CTGCACAGAGGTATTCATTATGTATAAGGGGCAAATTGTAGAAAAAGGAAATACAAAACG 1741 -----+ 1800 GACGTGTCTCCATAAGTAATACATATTCCCCGTTTAACATCTTTTTCCTTTATGTTTTGC DpnI Sau3AI Hpy178III PleI | NlaIII Hpy188IX HhaI | MseI FokI | | ThaI | NspI | AlwI | | | CATTTTTTCTGATCCACAACATCCTTATACGCGCATGTTGTTAAATGCCCAACTTCCAGA ${\tt GTAAAAAAGACTAGGTGTTGTAGGAATATGCGCGTACAACAATTTACGGGTTGAAGGTCT}$ DpnI BclI | Sau3AI | Hpy178III | Hpy188IX HaeIV|| HinfI | HinfI Hin4I|| HinfI || GACTCCTGATCAAAGGCAATCTAAACCTATATTCCAAGAATATCACAAAGATTCTGAAGA 1861 -----+ 1920 CTGAGGACTAGTTTCCGTTAGATTTTGGATATAAGGTTCTTATAGTGTTTCTAAGACTTCT CviRI FokI Cac8I | AluI | | SfcI CviJI ||| MboII HindIII | | | SfaNI ||Eco57I FokI - 1 ATCTTGCTCTACAGGATGCTACTTTTACAATCGTTGTCCACAAAAACAAGAAGCTTGCAA 1921 -----+ 1980 TAGAACGAGATGTCCTACGATGAAAATGTTAGCAACAGGTGTTTTTGTTCTTCGAACGTT BaeI HhaI DpnI BslI BciVIHinfI Sau3AI | BsmAI Thal |Hgal Taal Hpy188IX | | BsmBI |

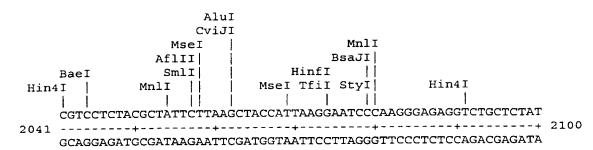
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 14 (con't)



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Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 15:

cgaagagcaa a	cctccacag tt	acagagaa aga	acgtccaa	cctaaaacac	aagcaacacc	60			
acacgcttcg a	agaaaaacg tt	gcaagtcc tto		atg cca gga Met Pro Gly 1		115			
aaa gca gca Lys Ala Ala	aca aca gtg Thr Thr Val 10	gct gta cct Ala Val Pro	caa gac Gln Asp 15	aaa tct gaa Lys Ser Glu	gaa gaa Glu Glu 20	163			
aaa gtt aaa Lys Val Lys	gag cga ttg Glu Arg Leu 25	aca aag cgg Thr Lys Arg 30	gaa ctt Glu Leu	acc tgt gaa Thr Cys Glu 35	gac ctt Asp Leu	211			
aaa gat aac Lys Asp Asn 40	ggc tat act Gly Tyr Thr	gtc aat ttt Val Asn Phe 45	gaa gac Glu Asp	att tct att Ile Ser Ile 50	tta gag Leu Glu	259			
ttg ttg cag Leu Leu Gln 55	ttc gta agt Phe Val Ser	aaa att tct Lys Ile Ser 60	gga acg Gly Thr	aac ttt gtc Asn Phe Val 65	ttt gat Phe Asp	307			
agc aac gat Ser Asn Asp 70	ttg caa ttc Leu Gln Phe 75	aat gtc acg Asn Val Thr	atc gtt Ile Val 80	tcc cac gat Ser His Asp	cct act Pro Thr 85	355			
tct gta gat Ser Val Asp	gat tta tct Asp Leu Ser 90	aca atc tta Thr Ile Leu	cta caa Leu Gln 95	gtc tta aaa Val Leu Lys	atg cat Met His 100	403			
gac ttg aag Asp Leu Lys	gtt gtt gaa Val Val Glu 105	caa ggc aat Gln Gly Asn 110	aac gtc Asn Val	ctt atc tat Leu Ile Tyr 115	Arg Asn	451			
	tct aag cta Ser Lys Leu					499			
gaa acg tgt Glu Thr Cys 135	gaa gct gtt Glu Ala Val	gtg gtt acc Val Val Thr 140	cga gtg Arg Val	ttc cgt ctt Phe Arg Leu 145	tac agg Tyr Arg	547			
cgt cag ccc Arg Gln Pro 150	tct gca gca Ser Ala Ala 155	gta aat att Val Asn Ile	att caa Ile Gln 160	cct tta ctt Pro Leu Leu	tcc cat Ser His 165	595			
gat gct atc Asp Ala Ile	gtt agt gct Val Ser Ala 170	tca gaa gct Ser Glu Ala	act cgt Thr Arg 175	cat gtt ato	atc tcg Ile Ser 180	643			
gat att gct Asp Ile Ala	ggt aat gtc Gly Asn Val 185	gat aaa gtc Asp Lys Val 190	agt gat Ser Asp	ttg cta gca Leu Leu Ala 195	Ala Leu	691			

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Title: CHLAMYDIA ANTIGENS AND TO LEAVE CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

09/830446

WO 00/24765

PCT/CA99/00992

Fig.	15	con	't)
------	----	-----	-----

gat Asp	tgc Cys	cca Pro 200	ggc Gly	aca Thr	tct Ser	gtg Val	gac Asp 205	atg Met	act Thr	gaa Glu	tac Tyr	gaa Glu 210	gtt Val	aaa Lys	tat Tyr	739
gcc Ala	aat Asn 215	ccc Pro	gca Ala	gct Ala	ctt Leu	gtt Val 220	agc Ser	tac Tyr	tgc Cys	caa Gln	gat Asp 225	gtt Val	ctt Leu	ggt Gly	act Thr	787
ctg Leu 230	gcc Ala	gaa Glu	gat Asp	gat Asp	gct Ala 235	ttc Phe	caa Gln	atg Met	ttc Phe	atc Ile 240	caa Gln	cct Pro	gga Gly	acg Thr	aac Asn 245	835
		ttc Phe														883
		aag Lys														931
		agt Ser 280														979
		ttg Leu														1027
gtg Val 310	att Ile	gct Ala	aat Asn	gcc Ala	ctc Leu 315	caa Gln	gat Asp	atc Ile	ggt Gly	tac Tyr 320	aat Asn	cta Leu	tat Tyr	gta Val	acc Thr 325	1075
		atg Met														1123
		gtc Val														1171
		gtt Val 360														1219
		atc Ile														1267
		gga Gly														1315

097830446

Title: CHLAMYDIA ANTIGENS AND TO THE CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 15 con't)

gct tat go Ala Tyr Al	ct tct gga la Ser Gly 410	cta ttg Leu Leu	aat aat Asn Asn	act ggo Thr Gly 415	ata gco / Ile Ala	aca cct Thr Pro 420	aca 1363 Thr	
aaa gca ad Lys Ala Th	et gtc cct nr Val Pro 425	ccc ggc Pro Gly	acg cca Thr Pro 430	aat cct Asn Pro	ggt tcg Gly Ser	atc cct Ile Pro 435	ctt 1411 Leu	
Pro Thr Pr	ca gga caa ro Gly Gln 10	ttg aca Leu Thr	ggg ttc Gly Phe 445	tca gat Ser Asp	atg ctg Met Lei 450	ı Asn Ser	tcg 1459 Ser)
tca gca tt Ser Ala Ph 455	tc ggt cta ne Gly Leu	gga atc Gly Ile 460	atc gga Ile Gly	aat gto Asn Val	c cta agt Leu Ser 465	cat aaa His Lys	ggg 1507 Gly	,
aag tct tt Lys Ser Ph 470	tc ctt act ne Leu Thr	ttg gga Leu Gly 475	ggc tta Gly Leu	tta agt Leu Sei 480	r Ala Leu	a gat caa 1 Asp Gln	gat 1555 Asp 485	j
gga gat ac Gly Asp Th	ct gtc att nr Val Ile 490	gtc ttg Val Leu	aat cct Asn Pro	aga ato Arg Ile 495	e atg gct e Met Ala	cag gat a Gln Asp 500	acg 1603 Thr	}
caa caa go Gln Gln Al	ct tcg ttt la Ser Phe 505	ttt gta Phe Val	ggg caa Gly Gln 510	acg gto Thr Val	c cct tac l Pro Tyi	caa act Gln Thr 515	atc 1651 Ile	•
Lys Tyr Ty	at atc caa yr Ile Gln 20	gaa aca Glu Thr	gga act Gly Thr 525	gta acq Val Th	g caa aat r Gln Asr 530	n Ile Asp	tat 1699 Tyr)
gaa gat at Glu Asp II 535	tt gga gtg le Gly Val	aac ctt Asn Leu 540	gtc gtt Val Val	acc tct Thr Se	t aca gtt r Thr Val 545	gct ccc l Ala Pro	aac 1747 Asn	,
	tt aca cta al Thr Leu				e Ser Glu			;
gcg tct g Ala Ser G	ga tca cta ly Ser Leu 570	Thr Pro	gtc aca Val Thr	gat aaa Asp Ly: 575	s Thr Ty	gca gcc Ala Ala 580	aca 1843 Thr	}
	aa att ccc ln Ile Pro 585			Leu Va				L
Arg Asp L	aa act aca ys Thr Thr 00					ı Leu Asn		€

Title: CHLAMYDIA ANTIGENS AND THE OFF BUILDING CORRESPONDING DNA FRAGMENTS

AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 15 con't)

ata Ile	cca Pro 615	tta Leu	att Ile	cgt Arg	ggt Gly	tta Leu 620	ttt Phe	agc Ser	cgt Arg	acc Thr	atc Ile 625	gac Asp	caa Gln	agg Arg	caa Gln	1987
aaa Lys 630	cgc Arg	aat Asn	atc Ile	atg Met	atg Met 635	ttt Phe	att Ile	aag Lys	cct Pro	aag Lys 640	gtg Val	att Ile	agt Ser	agc Ser	ttt Phe 645	2035
gaa Glu	gaa Glu	ggc Gly	act Thr	cgt Arg 650	gtt Val	acc Thr	aat Asn	aag Lys	gaa Glu 655	gga Gly	tac Tyr	aga Arg	tac Tyr	aat Asn 660	tgg Trp	2083
gaa Glu	gct Ala	gat Asp	gaa Glu 665	gga Gly	tcc Ser	atg Met	caa Gln	gtg Val 670	gcc Ala	cct Pro	cgc Arg	cat His	gct Ala 675	cct Pro	gaa Glu	2131
tgc Cys	caa Gln	gga Gly 680	cct Pro	cct Pro	tct Ser	tta Leu	cag Gln 685	gct Ala	gaa Glu	agt Ser	gac Asp	ttt Phe 690	aaa Lys	ata Ile	ata Ile	2179
	ata Ile 695			cag Gln	tagt	ggta	ata (caaaa	agago	ga ag	gatga	atatt	c ct	ccgc	gtg	2234
gaa	tagc	ttc 1	gac	tctg	t go	catto	cagg	g gga	aaago	ccaa	gaag	gatgt	ag a	agtc	ggccgt	2294
ata	act															2300

AND USES THEREOF

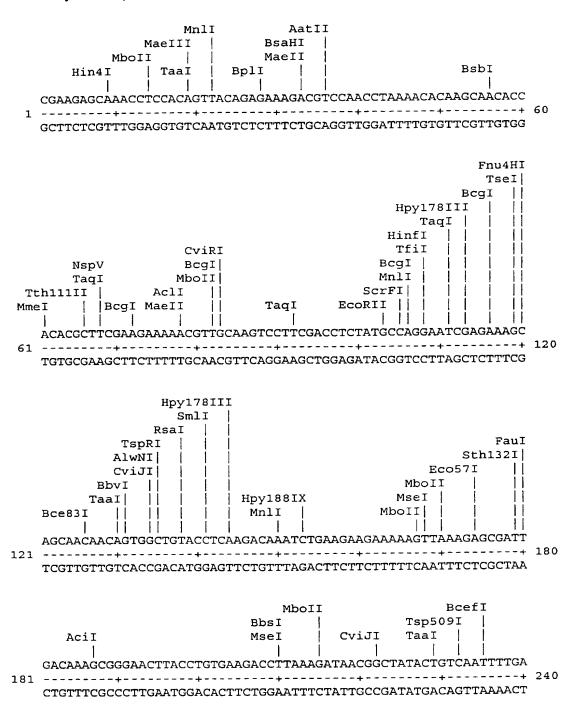
Inventor(s): Andrew D. MURDIN et al

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

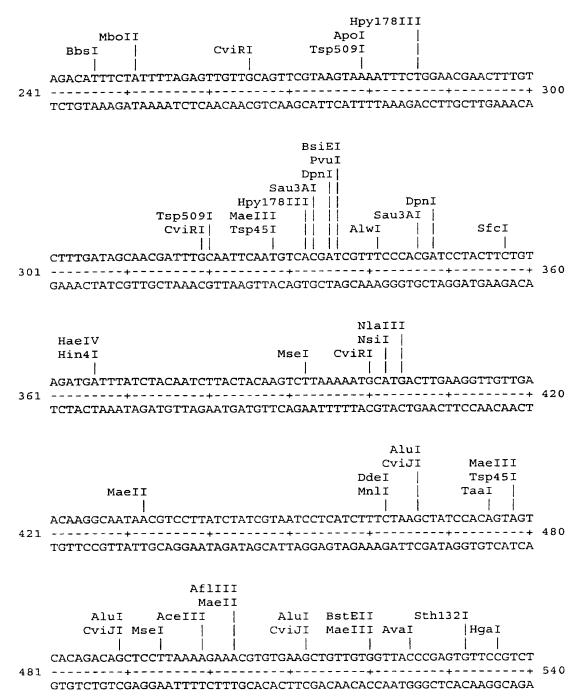
Figure 16 (RY-41)
Restriction enzyme analysis of CPN100538



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PCT/CA99/00992

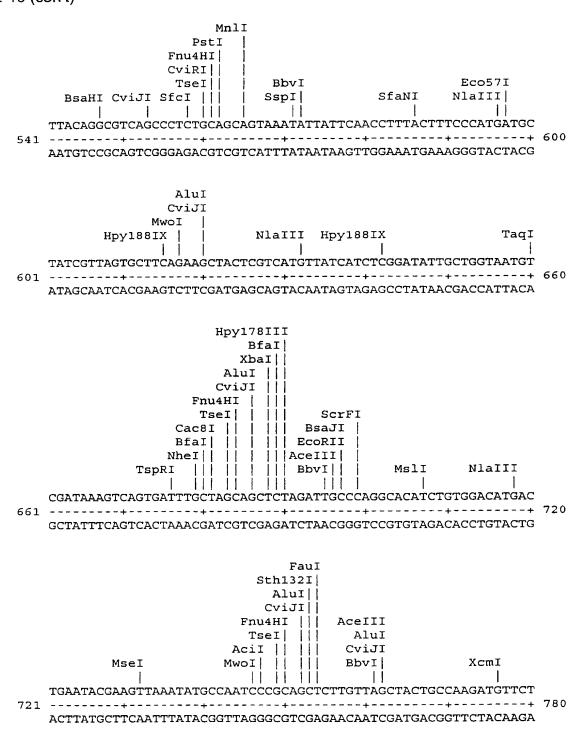


Title: CHLAMYDIA ANTIGENS AND TO THE OFF 830446 CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 16 (con't)

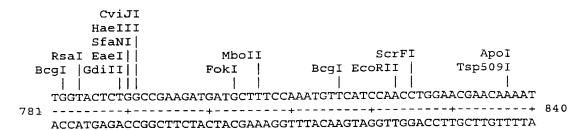


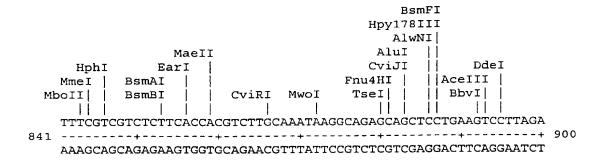
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

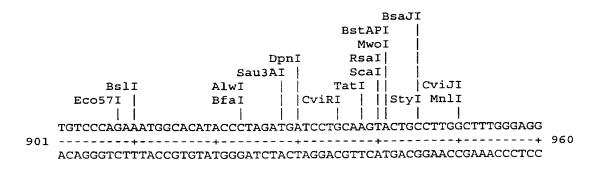
Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 16 (con't)





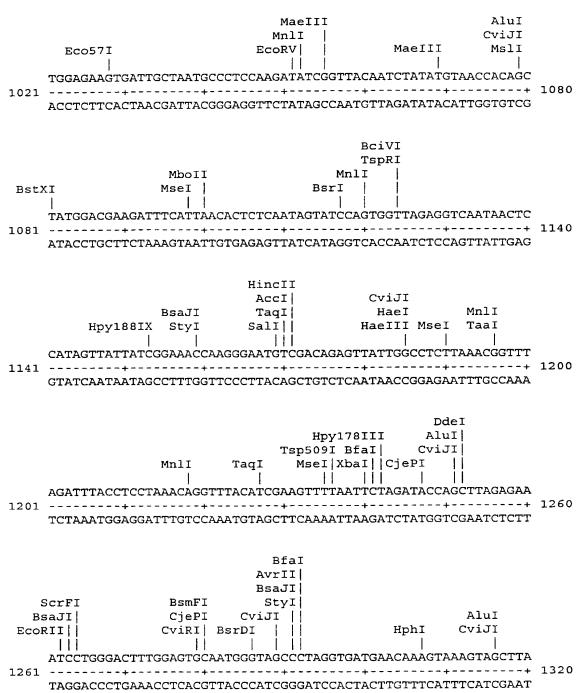




AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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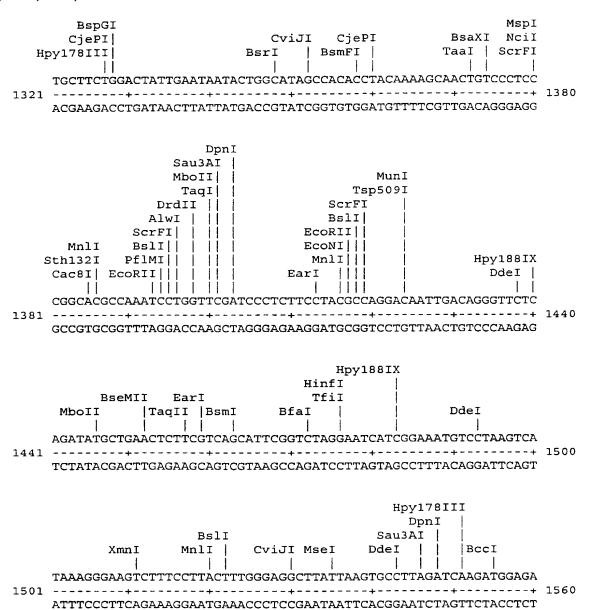
Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 16 (con't)

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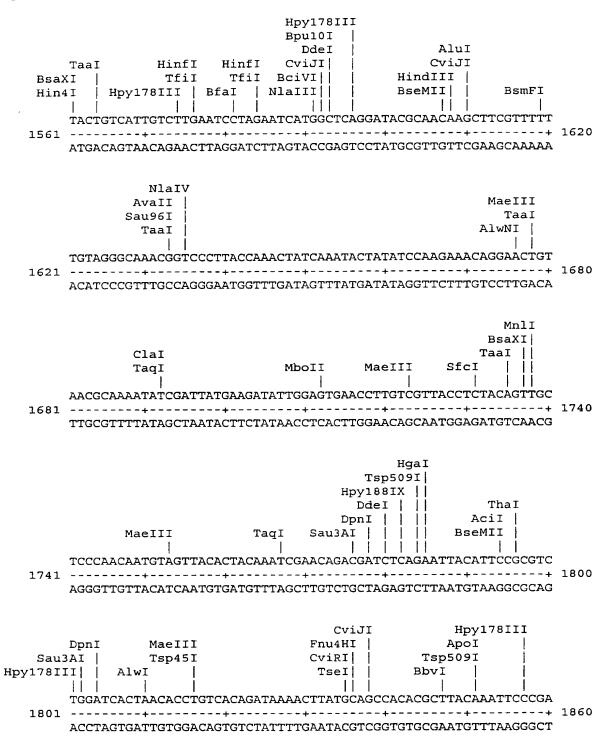


Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

WO 00/24765

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

PCT/CA99/00992



Inventor(s): Andrew D. MURDIN et al

PCT/CA99/00992

WO 00/24765 DOCKET NO.: 032931/0251 Fig. 16 (con't) Sth132I Hpy178III Hpy188IX TaaI DdeI CGGTTGTTTCTTAGTTATGAGTGGGCATATCAGAGATAAAACTACAAAAGTGGTTTCAGG 1861 -----+ 1920 GCCAACAAGAATCAATACTCACCCGTATAGTCTCTATTTTGATGTTTTCACCAAAGTCC TaqI BcefI BccI Tsp509I RsaI MseI | IqaV 1921 -----+ 1980 Bsu36I NlaIII Hpy178III | AAGGCAAAAACGCAATATCATGATGTTTATTAAGCCTAAGGTGATTAGTAGCTTTGAAGA 1981 -----+ 2040 TTCCGTTTTTGCGTTATAGTACTACAAATAATTCGGATTCCACTAATCATCGAAACTTCT DpnI NlaIV BamHI BstYI Sau3AI HaeIV Hin4I AlwI MaeIII

MboII

BssSI

BciVI

MunI

Tsp509I

AGGCACTCGTGTTACCAATAAGGAAGGATACAGATACAATTGGGAAGCTGATGAAGGATC 2041 -----+ 2100 TCCGTGAGCACAATGGTTATTCCTTCCTATGTCTATGTTAACCCTTCGACTACTTCCTAG

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CviJI

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

Fig. 16 (con't)

Company of

2101+	I I I I I I I I I I	BsaJI StyI CCTGAATGCCAA	OI SI SI VI 	+	2160
		DdeI			
MaeIII DraI		AluI	BseMII		
Tsp45I MseI		viJI	MnlI	BcefI	
		1 İ	11	1	
AAGTGACTTT	'AAAATAATAGAAATA	GAAGCTCAGTAC	TGGTATATAA	AAGAGGAAGATGA	
2161+	+	+	. +	+	2220
	TTTTATTATCTTTAT				
BsaJI BstDSI EciI AciI MboII 	AluI	 BsmI CviRI		iJI BcefI AAGCCAAGAAGAT	
2221+	.CG1GGAA1AGC11C1	GACICIGIIGC	IIICAGGGGGA		2280
	GCACCTTATCGAAGA				
Pl	.eI				
BsiE	I				
CviJI					
HaeIII	:11				
EaeI					
EagI					
GdiII					
MboII	11				
HinfI	11				
HaeIV					
Hin4I	11				
	İİ				
GTAGAGTCGG	CCGTATAACT				

2281 ----- 2300 CATCTCAGCCGGCATATTGA

097830446

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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WO 00/24765

Figure 17: CPN100	0557	_
tagcttgaaa tagcttcc	tc caattgtgat ttctgaag	aa gtataggggg aaatgtcgaa 60
gagatagtct tgttttaa	ag gaggagggga aaacggtt	ta atg agc aga aaa gac 115 Met Ser Arg Lys Asp Arg Lys Asp 1 5
Asn Glu Val Ser Leu	Ala Arg Ser Ile Phe A Ala Arg Ser Ile Phe A	as at at at tcc gga act 163 as Ile Leu Ser Gly Thr son Ile Leu Ser Gly Thr 20
Phe Cys Ser Arg Ile	Thr Gly Ile Phe Arg G	aaa att gca atg gca acc 211 Slu Ile Ala Met Ala Thr Slu Ile Ala Met Ala Thr 35
Tyr Phe Gly Ala Asp	Pro Ile Val Ala Ala P	tc tgg tta ggt ttc cgt 259 The Trp Leu Gly Phe Arg The Trp Leu Gly Phe Arg 50
Thr Val Phe Phe Leu	Arg Lys Ile Leu Gly G	ggg ctc att cta gaa caa 307 Sly Leu Ile Leu Glu Gln Sly Leu Ile Leu Glu Gln 65
Ala Phe Ile Pro His	Phe Glu Phe Leu Arg A	gct caa agt ctc gat cgt 355 Ala Gln Ser Leu Asp Arg Ala Gln Ser Leu Asp Arg 80 85
Ala Ala Phe Phe Phe	Arg Arg Phe Ser Arg L Arg Arg Phe Ser Arg L	ttg att aaa ggc agc act 403 eu Ile Lys Gly Ser Thr eu Ile Lys Gly Ser Thr 100
Ile Ile Phe Thr Leu	Leu Ile Glu Ala Val L	teg tgg gta ttc ttc aat 451 Leu Trp Val Phe Phe Asn Leu Trp Val Phe Phe Asn 115
Asn Val Glu Glu Gly	[,] Thr Tyr Asp Met Ile I	tee ctt act atg ata ctc 499 Leu Leu Thr Met Ile Leu Leu Leu Thr Met Ile Leu 130
Leu Pro Cys Gly Ile	Phe Leu Met Met Tyr A	ast gta aac ggc gct ttg 547 Asn Val Asn Gly Ala Leu Asn Val Asn Gly Ala Leu 145
Leu His Cys Gly Asn	Lys Phe Phe Gly Val G Lys Phe Phe Gly Val G	gga tta gct ccc gta gtt 595 Sly Leu Ala Pro Val Val Sly Leu Ala Pro Val Val 160 165
Val Asn Ile Ile Trp	o Ile Phe Phe Val Ile A o Ile Phe Phe Val Ile A	gcg gct cgt cat tca gat 643 Ala Ala Arg His Ser Asp Ala Ala Arg His Ser Asp 180

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Title: CHLAMYDIA ANTIGENS AND TO THE CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 17 (con't)

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Pro	Arg	gag Glu Glu	Arg	Ile	Ile	Gly	Leu	Ser	Val	Ala	Leu	Val	Ile	Gly	Phe	691
Phe	Phe	gaa Glu Glu 200	Trp	Leu	Ile	Thr	Val	Pro	Gly	Val	Trp	Lys	Phe	Leu	Leu	739
Ğlu	Ala	aag Lys Lys	Ser	Pro	Pro	Gln	Glu	His	Asp	Ser	Val	Arg	Ala	Leu	Leu	787
Āla	Pro	tta Leu Leu	Ser	Leu	Gly	Ile	Leu	Thr	Ser	Ser	Ile	Phe	Gln	Leu	Asn	835
Leu	Leu	tct Ser Ser	Asp	Ile	Cys	Leu	Ala	Arg	Tyr	Val	His	Glu	Ile	Gly	Pro	883
Leu	Tyr	ctt Leu Leu	Met	Tyr	Ser	Leu	Lys	Ile	Tyr	Gln	Leu	Pro	Ile	His	Leu	931
Phe	Gly	ttt Phe Phe 280	Gly	Val	Phe	Thr	Val	Leu	Leu	Pro	Ala	Ile	Ser	Arg	Cys	979
Val	Gln	cga Arg Arg	Glu	Asp	His	Glu	Arg	Gly	Leu	Lys	Leu	Met	Lys	Phe	Val	1027
Leu	Thr	cta Leu Leu	Thr	Met	Ser	Val	Met	Ile	Ile	Met	Thr	Ala	Gly	Leu	Leu	1075
Leu	Leu	gct Ala Ala	Leu	Pro	Gly	Val	Arg	Val	Leu	Tyr Tyr	Glu	His	Gly	Leu	Phe	1123
Pro	Gln	agt Ser Ser	Ala	Val Val	Tyr	Ala	Ile	Val	Arg Arg	Val	Leu	Arg	Gly	Tyr	Gly	1171
Ala	Ser	att Ile Ile 360	Ile Ile	Pro	Met	Ala	Leu	Ala Ala	Pro	Leu	Val	Ser	Val Val	Leu	Phe	1219

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Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

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Fig. 17 (con't)	
tat gca cag cgg cag tat gct gtt ccg ctc ttt ata gga atc ggt acg Tyr Ala Gln Arg Gln Tyr Ala Val Pro Leu Phe Ile Gly Ile Gly Thr Tyr Ala Gln Arg Gln Tyr Ala Val Pro Leu Phe Ile Gly Ile Gly Thr 375 380 385	1267
gct ttg gcc aat att gtt tta agc ttg gtt cta ggt cgt tgg gtt tta Ala Leu Ala Asn Ile Val Leu Ser Leu Val Leu Gly Arg Trp Val Leu Ala Leu Ala Asn Ile Val Leu Ser Leu Val Leu Gly Arg Trp Val Leu 390 395 400 405	1315
aaa gac gtc tcg ggc att tcc tat gct aca tcc ata act gct tgg gtg Lys Asp Val Ser Gly Ile Ser Tyr Ala Thr Ser Ile Thr Ala Trp Val Lys Asp Val Ser Gly Ile Ser Tyr Ala Thr Ser Ile Thr Ala Trp Val 410 415 420	1363
cag tta tat ttc ctc tgg tat tat tct tcg aaa aga ctc cct atg tac Gln Leu Tyr Phe Leu Trp Tyr Tyr Ser Ser Lys Arg Leu Pro Met Tyr Gln Leu Tyr Phe Leu Trp Tyr Tyr Ser Ser Lys Arg Leu Pro Met Tyr 425 430 435	1411
tct aag tta ctt tgg gag agc atc cgg cgt tcc ata aaa gtt atg gga Ser Lys Leu Leu Trp Glu Ser Ile Arg Arg Ser Ile Lys Val Met Gly Ser Lys Leu Leu Trp Glu Ser Ile Arg Arg Ser Ile Lys Val Met Gly 440 445 450	1459
acc act atg ctt gct tgt atg att act cta ggc tta aat atc ctt acg Thr Thr Met Leu Ala Cys Met Ile Thr Leu Gly Leu Asn Ile Leu Thr Thr Thr Met Leu Ala Cys Met Ile Thr Leu Gly Leu Asn Ile Leu Thr 455 460 465	1507
caa act aca tat gta att ttc tta aac ccc ctc aca cca ctt gct tgg Gln Thr Thr Tyr Val Ile Phe Leu Asn Pro Leu Thr Pro Leu Ala Trp Gln Thr Thr Tyr Val Ile Phe Leu Asn Pro Leu Thr Pro Leu Ala Trp 470 475 480 485	1555
ccc tta tcc tcc ata acg gct caa gca att gct ttt tta tct gag agc Pro Leu Ser Ser Ile Thr Ala Gln Ala Ile Ala Phe Leu Ser Glu Ser Pro Leu Ser Ser Ile Thr Ala Gln Ala Ile Ala Phe Leu Ser Glu Ser 490 495 500	1603
tgc att ttc ttg gct ttt ttg ttt ggt ttt gca aaa ctg ctt cga gta Cys Ile Phe Leu Ala Phe Leu Phe Gly Phe Ala Lys Leu Leu Arg Val Cys Ile Phe Leu Ala Phe Leu Phe Gly Phe Ala Lys Leu Leu Arg Val 505 510 515	1651
gaa gat ctt att aat ttg gct tct ttt gaa tac tgg cgt ggg caa cgg Glu Asp Leu Ile Asn Leu Ala Ser Phe Glu Tyr Trp Arg Gly Gln Arg Glu Asp Leu Ile Asn Leu Ala Ser Phe Glu Tyr Trp Arg Gly Gln Arg 520 525 530	1699
ggt ctt ttg caa aga caa cac gtg atg caa gac act caa aat Gly Leu Leu Gln Arg Gln His Val Met Gln Asp Thr Gln Asn Gly Leu Gln 535 540 545	1741
taatcatgtt tgtttcttgt agctcagtcg ctttctttta gctttaagtt ttgatagcct	1801
gcttggtctt ctgtttctac acttaatatt gatactaagg atactatgaa aaaacaggta	1861
tatcaatggt tagegagtgt ggttetttta gegetgaca	1900

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SUBSTITUTE SHEET (RULE 26)

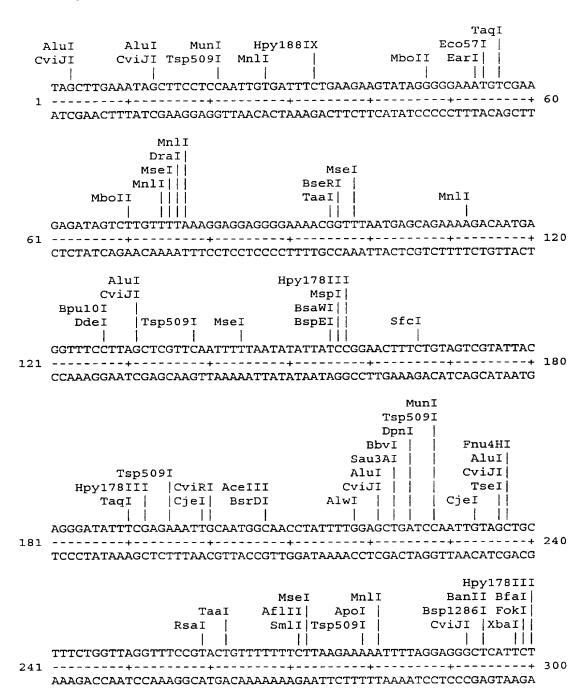
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

Figure 18 (RY-43)

WO 00/24765

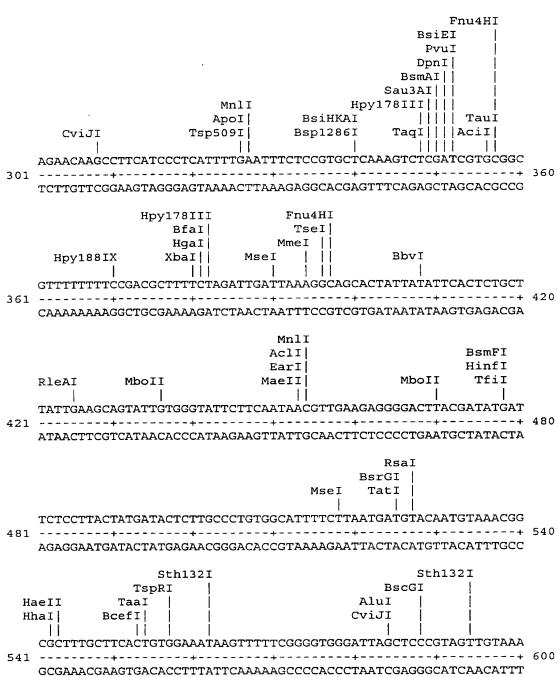
Restriction enzyme analysis of CPN100557



AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

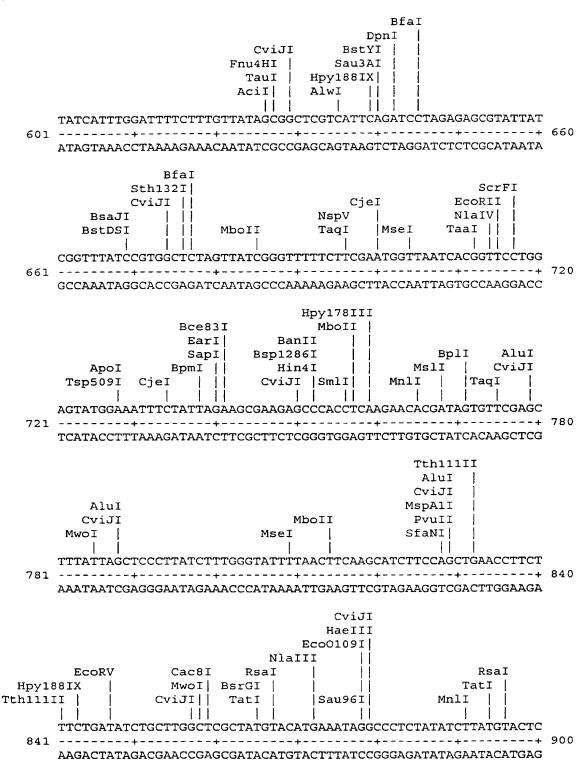
WO 00/24765



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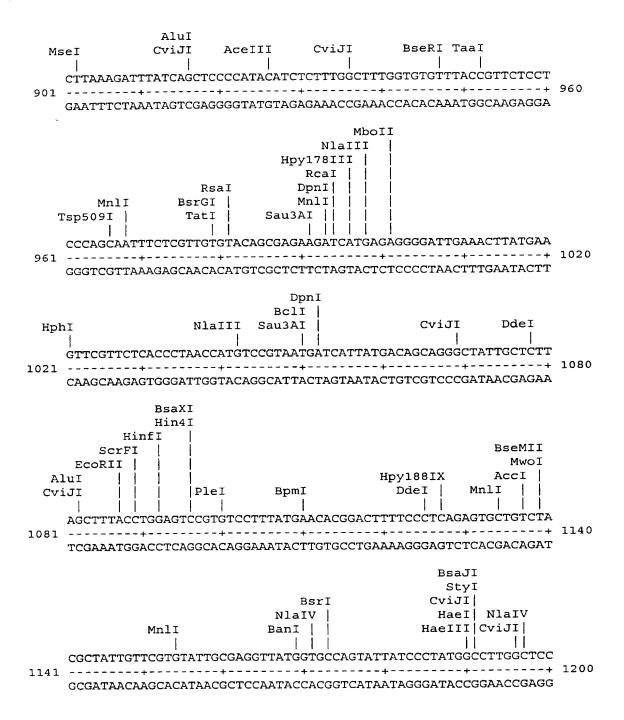
Title: CHLAMYDIA ANTIGENS AND COURT OF THE SUPPLY SUPER SOURCESPONDING DNA FRAGMENTS

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

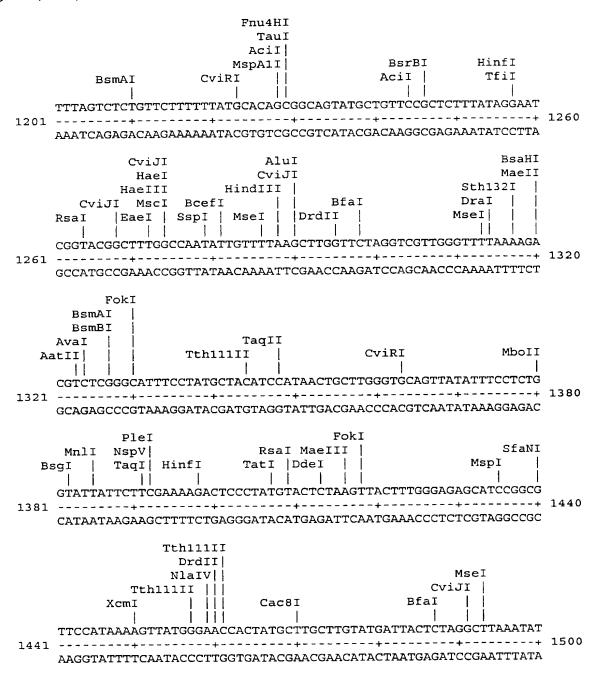
PCT/CA99/00992



Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 18 (con't)



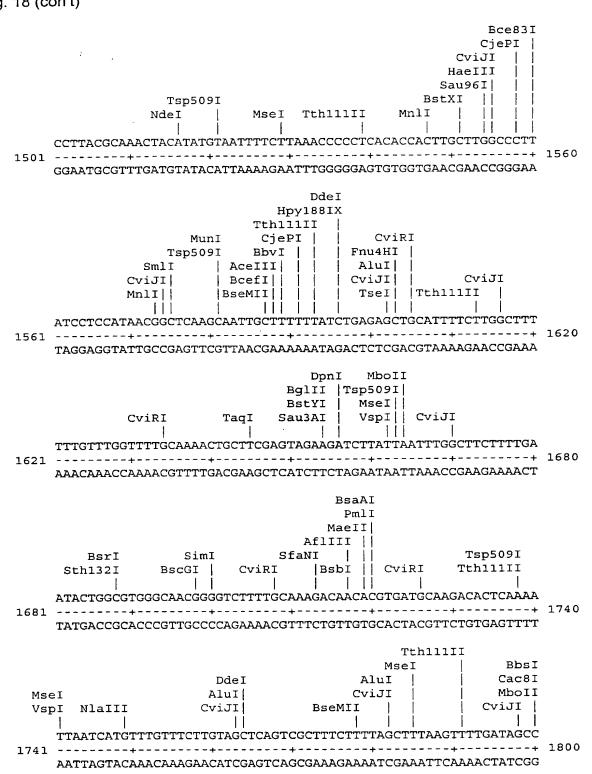
Title: CHLAMYDIA ANTIGENS AND

CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

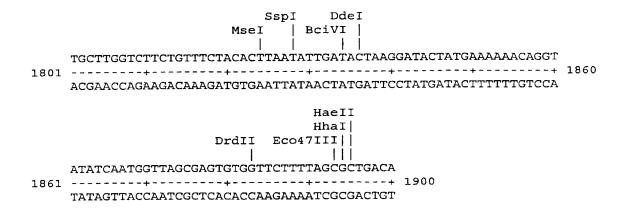
Fig. 18 (con't)



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Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al

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DOCKET NO.: 032931/0251

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Figure 19: CPN100622																
totcaagagt aacottatoo ttagattatt cagotcaagt otootogtoa actgtaggto 60													cc 60			
aat	acct	taa:	agct	gaga:	igt c	attg	caca	at ti	taad	caca	Me				a agg r Arg 5	115
aat Asn	aaa Lys	caç Gln	ı tgo L Cys	aaa Lys 10	Ile	aca Thr	gat Asp	Pro	tta Lev 15	Ser	aaa Lys	a to: s Se:	t tco	tto Phe	ttt Phe	163
gtt Val	gga Gly	gcc Ala	tta Leu 25	att	tta Leu	ggt Gly	aaa Lys	act Thr	Thr	ata Ile	t cto	c ctt Lei	aat Asr 35	Ala	g act a Thr	211
ccg Pro	ttg Leu	tct Ser 40	gac Asp	tat Tyr	ttt Phe	gat Asp	aat Asn 45	caa Gln	gca Ala	aat Asn	caa Glr	cto Leu 50	Thr	aca Thr	ctc Leu	259
ttc Phe	cct Pro 55	cta Leu	att Ile	gat Asp	act Thr	ctt Leu 60	act Thr	aac Asn	atg Met	act Thr	ccc Pro 65	Туг	tct Ser	cat His	aga Arg	307
gca Ala 70	aca Thr	ctt Leu	ttt Phe	gga Gly	gtt Val 75	agg Arg	gat Asp	gac Asp	act Thr	aac Asn 80	caa Gln	gac	att Ile	gtc Val	ctc Leu 85	355
gat Asp	cac His	cag Gln	aat Asn	tcc Ser 90	ata Ile	gaa Glu	agc Ser	tgg Trp	ttc Phe 95	gaa Glu	aac Asn	ttc Phe	tct Ser	caa Gln 100	gac Asp	403
ggc Gly	ggt Gly	gct Ala	ctc Leu 105	tct Ser	tgc Cys	aaa Lys	tca Ser	ctt Leu 110	gcc Ala	ata Ile	acg Thr	aat Asn	aca Thr 115	aaa Lys	aac Asn	451
caa Gln	att Ile	ctt Leu 120	ttc Phe	cta Leu	aat Asn	agc Ser	ttt Phe 125	gct Ala	att Ile	aaa Lys	aga Arg	gct Ala 130	ggt Gly	gcg Ala	atg Met	499
Tyr	gtt Val 135	gat Asp	ggt Gly	aat Asn	ttc Phe	gat Asp 140	ctt Leu	tct Ser	gag Glu	aat Asn	cat His 145	ggt Gly	tcc Ser	atc Ile	att Ile	547
ttç Phe 150	tct Ser	Gly 999	aat Asn	tta Leu	agc Ser 155	ttt Phe	cct Pro	aat Asn	gca Ala	agt Ser 160	aat Asn	ttc Phe	gct Ala	gat Asp	act Thr 165	5 95
tgt Cys	aca Thr Thr	Gry	GTÀ	WIG	va.	ьeu	CVS	Ser	Lvs	Asa	Val	アカー	Ile Ile	Sar	Tire	643
WOII	caa Gln Gln	GTÀ	$I \cap \mathcal{I}$	Ala	IAL	rne	Ile	Asn	Asn	Tave	Δ l =	Lys Lys	C ~ ~	C ~ ~	C :	691

Title: CHLAMYDIA ANTIGENS AND COLOR OF 7830446 AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig.	19 ((con't)
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WO 00/24765

_		-	•													
Gly	' Ala	Ile	Gln Gln	Ala	Ala	Ile	Ile	Asn Asn	ı Ile	Lvs	Ast	Asr	Thr Thr	· čī,	cct y Pro y Pro	739
tgc	ctg	ttt	ttt	aat	aat	gct	gca	ggc	gga	aca	gee	999		a a c	g ttg	787
Cys	Leu	Phe	Phe	Asn	Asn	Ala	Ala Ala	Gly	Gly	Thr	Ala	a Gly	/ Gl	y Al	a Leu a Leu	
Phe	Ala	Asn	Ala	Cys	Arg	Ile	Glu	Asn	Asn	Ser	Gln Gln	Pro	Ile	Tv:	t ttt r Phe r Phe 245	835
Leu	Asn	Asn	Gln	Ser	Gly	Leu	Gly	Gly	Ala	Ile	Arg	Val	His	Glr	a gag n Glu n Glu	883
Cys	att Ile Ile	Leu	Thr	Lys	Asn	Thr	Gly	Ser	Val	Ile	Phe	Asn	Asn	Asr Asr	Phe	931
Ala	atg Met Met	Glu	Ala	Asp	Ile	Ser	Ala	Asn	His	Ser	Ser	Glv	Ğİv	Āla	Ile	979
Tyr	tgc Cys Cys 295	Ile	Ser	Cys	Ser	Ile	Lys	Asp	Asn	Pro	Gly	Ile	Ala	Ala	Phe	1027
Asp	aat Asn Asn	Asn	Thr	Ala	Ala	Arg	Asp	Gly	Gly	Ala	Ile	Cys	Thr	Gln	Ser	1075
Leu	act Thr Thr	Ile	Gln	Asp	Ser	Gly	Pro	Val	Tyr	Phe	Thr	Asn	Asn	Gln	ĞÎv	1123
Thr	tgg Trp Trp	Gly	Gly	Ala	Ile	Met	Leu Leu	Arg	Gln	Asp	Gly	Ala	Cys	Thr	Leu	1171
Phe	gct Ala Ala	Asp	Gln	Gly	Asp	Ile Ile	Ile	Phe	Tyr	Asn	Asn Asn	Arg	His	Phe	Lvs	1219
Asp Asp	act Thr Thr 375	Phe	Ser .	Asn	His His	Val	Ser	Val	Asn	Cys	Thr	Arq	Asn	Val	Ser	1267

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Title: CHLAMYDIA ANTIGENS AND 11 11 10 97 830446

CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 19 (con't)

Leu	Thr Thr	Val	Gly	Ala	Ser	Gln Gln	Gly	His	Ser	Ala	Thi Thi	Phe	TVI	Āst	Pro Pro 405	1315
Ile	Leu	Gln	Arg	Tyr	Thr	Ile	Gln	Asn	Ser	Ile	Gln	Lvs	Phe	Asr	cct Pro	1363
Asn	Pro	Glu	His	Leu	Gly	Thr	Ile	Leu	Phe Phe	Ser	Ser	Thr	Ty	Ile Ile	ccg Pro Pro	1411
Asp	Thr	Ser	Thr Thr	Ser	Arg	Asp	Asp	Phe	Ile	Ser	His	Phe	Arc	Asr	cac His His	1459
Ile	Gly	Leu	Tyr	Asn	Gly	Thr	Leu	Ala	Leu	Glu	Asp	Arg	Ala	Glu	tgg Trp Trp	1507
Lys	Val	Tyr	Lys	Phe	Asp	Gln	Phe	Gly	Gly	Thr	Leu	Arg	Leu	Glv	agt Ser Ser 485	1555
Arg	Ala	Val	ttt Phe Phe	Ser	Thr	Thr	Asp	Glu	Glu	Gln	Ser	Ser	Ser	Ser	Val	1603
Gly	Ser	Val	att Ile Ile 505	Asn	Ile	Asn	Asn	Leu	Ala	Ile	Asn	Leu	Pro	Ser	Ile	1651
Leu	Gly	Asn	aga Arg Arg	Val	Ala	Pro	Lys	Leu	Trp	Ile	Arg	Pro	Thr	Gly	Ser	1699
Ser	Ala	Pro	tat Tyr Tyr	Ser	Glu	Asp	Asn	Asn	Pro	Ile	Ile	Asn	Leu	Ser	Gly	1747
Pro	Leu	Ser	cta Leu Leu	Leu	Asp	Asp	Glu	Asn	Leu	Asp	Pro	Tyr	Asp	Thr	Āla	1795
Asp	Leu	Ala	caa Gln Gln	Pro	Ile	Ala	Glu	Val	Pro	Leu	Leu	Tyr	Leu	Leu	Asp	1843

Title: CHLAMYDIA ANTIGENS AND SOLUTION CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

Fia.	19	(con't)

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_		*	77	Uic	Tla	T.VS	Ala	Ser	GLV	TVT	ser	GIV	T A 2	ata Ile Ile	GTII	2467
m L	Č1	C1	Ttre	CVS	ጥህጉ	Ser	Thr	Thr	Leu	GLV	Ala	Ala	Leu	tct Ser Ser	Cys	2515
C ~ ~	T 011	Sar	1.011	Gln	TTD	Ara	Ser	Ara	Pro	Leu	His	Pne	Inr	Pro Pro 820	Pne	2563
T1.	C1 n	ñla	TIA	2,2	Val	Ara	Ser	Asn	Gln	Thr	Ala	Phe	Gin	gaa Glu Glu	Ser	2611
ČĪ.	Den	LAVE	Δla	Arc	Lvs	Phe	Ser	Val	His	Lys	Pro	Leu	Tyr	aac Asn Asn	Leu	2659
ምክ ም	Ūa1	D-0	1.011	Gly	Ile	Gln	Ser	Ala	Tro	Glu	Ser	Lys	Phe	cgt Arg Arg	Leu	2707
Pro	Thr	Tvr	Trn	Asn	Ile	Glu	Leu	Ala	Tvr	Gln	Pro	Val	Leu	tac Tyr Tyr	Gln	2755
Gla	Asn	Pro	Glu	Ile	Asn	Val	Ser	Leu	Glu	Ser	Ser	Gly	Ser	tca Ser Ser 900	Trp	2803
T.A.II	T.e.11	Ser	Glv	Thr	Thr	Leu	Ala	Arq	Asn	Ala	Ile	Ala	Phe	aaa Lys Lys	Gly	2851
Ara	Asn	Gla	Ile	Phe	Ile	Phe	Pro	Lys	Leu	Ser	Val	Phe	Leu	gac Asp Asp	Tyr	2899
Gln	Ğİv	Ser	Val	Ser	Ser	Ser	Thr	Thx	Thr	Hıs	Tyr	Leu	His	gca Ala Ala	Gly	2947
Thr	Thr Thr	Phe	Lys	Phe	taa	aagc	atg 1	ttata	ataga	ac aa	atgca	aacc	t gta	aaaga	acca	3002
aatagagagt agtgaacact ctctaccatc atgaatctta tgggagaagc taagggaaat										3062						
ccacagatac gtttccccca taaaaattaa gaacccgata catcctcact agagattcga										3122						
aagaactact taaatcctaa gcattcga 88/165										3150						

Title: CHLAMYDIA ANTIGENS AND THE 09783 CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 19 (con't)

Val	Thr	Δla	Lvs	His	att Ile Ile	Asn	Thr	Asp	Asn	Phe	Tyr	Pro	Glu	Gly	Leu	1891
Asn	Thr	Thr	Gln	His	tac Tyr Tyr	Gly	Tyr	Gln	Gly	Val	Trp	Ser	Pro	Tyr	Trp	1939
TIP	Glu	Thr	Tle	Thr	act Thr Thr	Ser	Aso	Thr	Ser	Ser	Glu	Asp	Thr	Val	Asn	1987
Thr	Leu	His	Arg	Gln	ctt Leu Leu 635	Tyr	Gly	Asp	Trp	Thr	Pro	Thr	Gly	Tyr	aag Lys Lys 645	2035
Val	Asn	Pro	Glu	Asn	aaa Lys Lys	Gly	Asp	Ile	Ala	Leu	Şer	Ala	Phe	Trp	Gln Gln	2083
Ser	Phe	His	Asn	Leu	ttt Phe Phe	Ala	Thr	Leu	Arg	Tyr	Gln	Thr	Gln	Gln	Ğĺy	2131
Gln	Ile	Ála	Pro	Thr	gct Ala Ala	Ser	Gly	Glu	Āla	Thr	Arg	Leu	Phe	Val	His	2179
Gln	Asn	Ser	Asn	Asn	gat Asp Asp	Ala	Lys	Ğly	Phe	His	Met	Glu	Āla	Thr	Ğİy	2227
Tyr	Ser	Leu	Gly	Thr	acc Thr Thr 715	Ser	Asn	Thr	Ala	Ser	Asn	His	Ser	Phe	Gly	2275
٧al	Asn	Phe	Ser	Gln	ctt Leu Leu	Phe	Ser	Asn	Leu	Tyr	Ğlü	Ser	His	Ser	Ásp	2323
Asn	Ser	Val	Āla	Ser	cat His His	Thr	Thr	Thr	Val	Ala	Leu	Gln	Ile	Asn	Asn	2371
Pro	Trp	Leu	Gln	Glu	aga Arg Arg	Phe	Ser	Thr	Ser	Āla	Ser	Leu	Āla	Tyr	Ser	2419

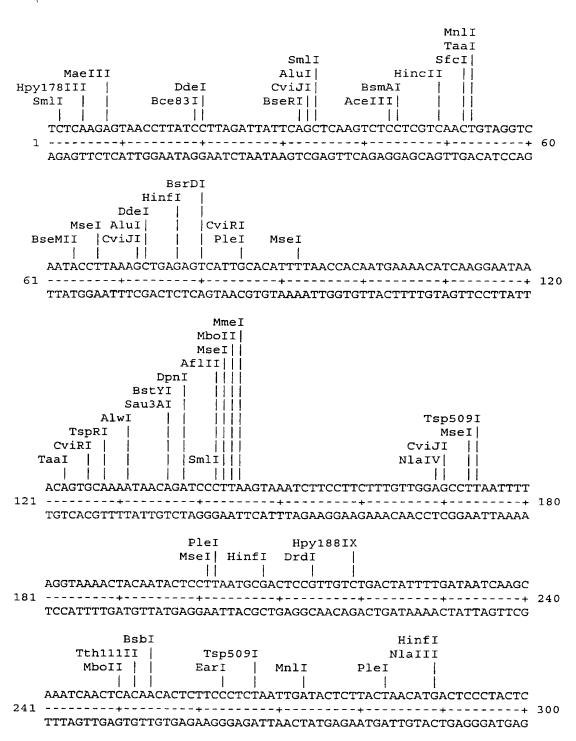
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AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 20 (RY-44)

Restriction enzyme analysis of CPN100622

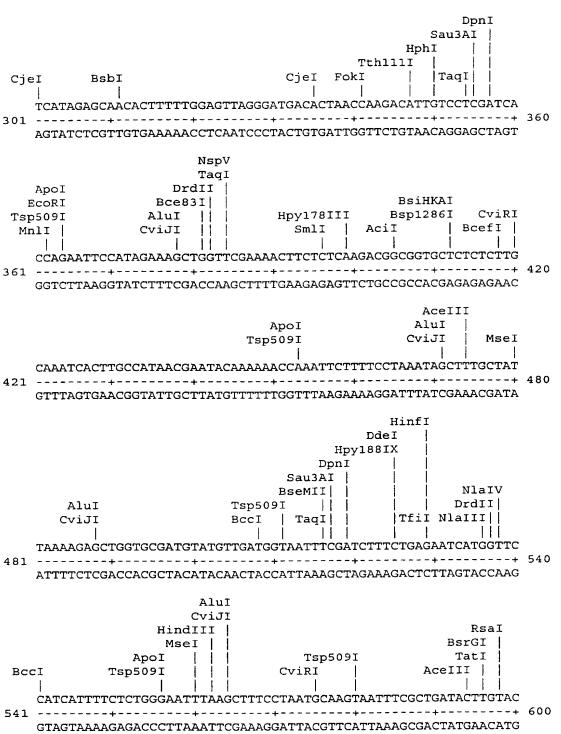


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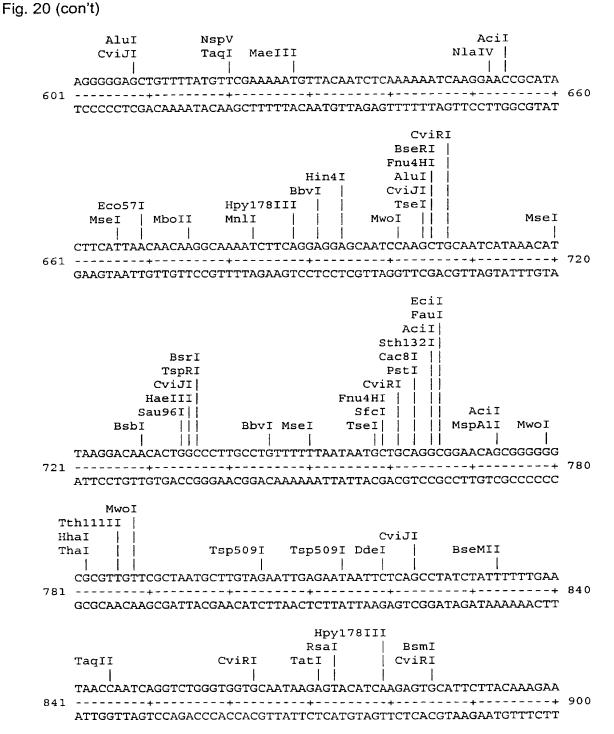
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Fig. 20 (con't)



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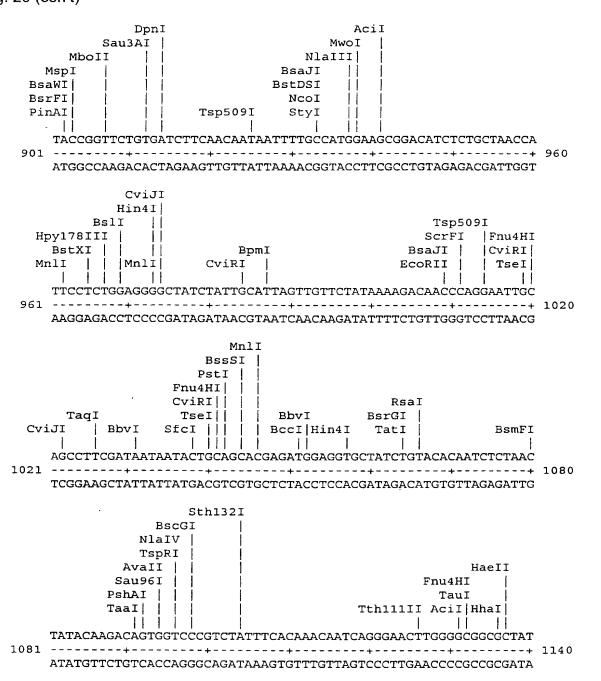
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Fig. 20 (con't)



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Fig. 20 (con't)

	CviRI			
	NlaIII			
	NspI			
	SphI			
	Cac8I	Dpn1	I	
	Hpy178III CviRI	BclI		
N	aIII BccI	Sau3AI		
14.2		1		
	CATGCTCCGTCAAGATGGTGCATGC	ACTTTATTTGCTG!	ATCAGGGAGATATTATTTTTT	Ą
1141			-+	1200
7741	GTACGAGGCAGTTCTACCACGTACG	TGAAATAAACGAC	ragtccctctataataaaaaa	r
	GIACGAGGEAGII CIII.CCII.CCI			
			MmeI	
			ThaI	
			AflIII	
			Cac8I	
		NlaIII	MluI	
			CVIRI	
		BsgI	CVIRI	
		 		`
	TAATAATAGACACTTCAAAGATACT			. 1260
1201		+		
	ATTATTATCTGTGAAGTTTCTATGA	AAGTCGTTAGTAC	AAAGACATTIGACGTGCGCAT	L
			Down T	
			DpnI	
	MseI		Sau3AI	
	BsmAI TaaI		Alwi	
				_
	TGTCTCATTAACAGTTGGAGCAAGT		CTACCTTCTATGATCCCATAC	
1261	+		•	+ 1320
	ACAGAGTAATTGTCAACCTCGTTCA	GTTCCAGTAAGAC	GATGGAAGATACTAGGGTATG	4
		CjeP:	I.	
		MseI		
		ApoI	Hpy188IX	
		Tsp509I	Hpy178III BsaJI	
	ACAAAGATATACTATACAAAACTCT	'ATCCAAAAATTTA	ATCCTAATCCAGAACACCTCG	G
1321		+	•	
	TGTTTCTATATGATATGTTTTGAGA	TAGGTTTTTAAAT	TAGGATTAGGTCTTGTGGAGC	C
	Hpy1	.78III		
		MspI		
	Bs	aWI		
	Bs	pEI		
	MnlI BciVI		Hpy178III	
	BseRI CjePI Mnl1		BssSI	
			l İ	
	AACTATCTTGTTCTCCTCAACATAT	ATTCCGGATACAT	CGACTTCTCGTGATGACTTCA	Т
1381			_+	
1001		TA AGGCCTATGTA	GCTGAAGAGCACTACTGAAGT	A

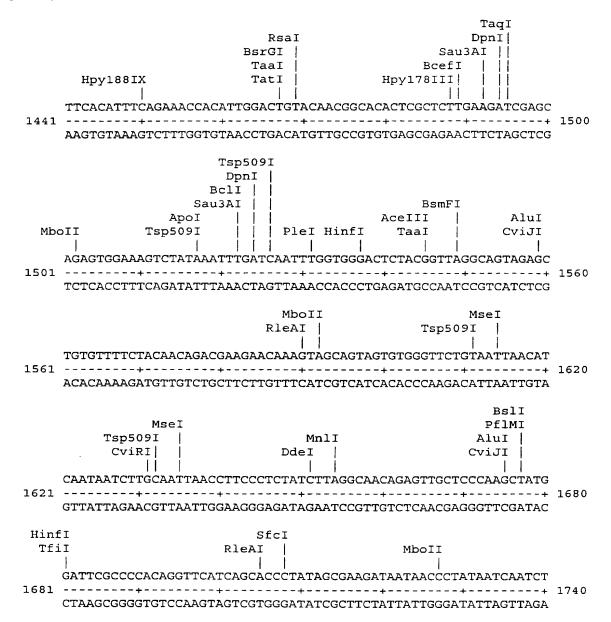
Title: CHLAMYDIA ANTIGENS AND 5 1 1 1 09 / 830 446 CORRESPONDING DNA FRAGMENTS

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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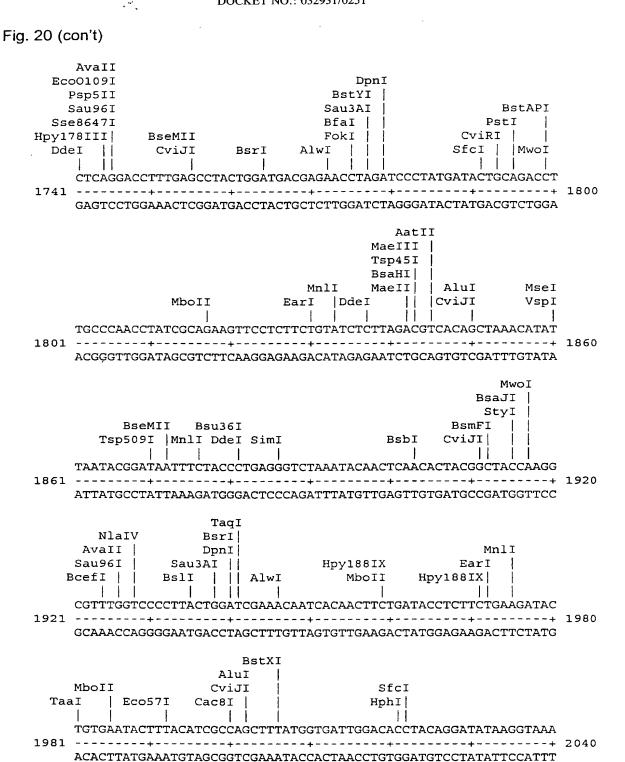
Fig. 20 (con't)



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Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

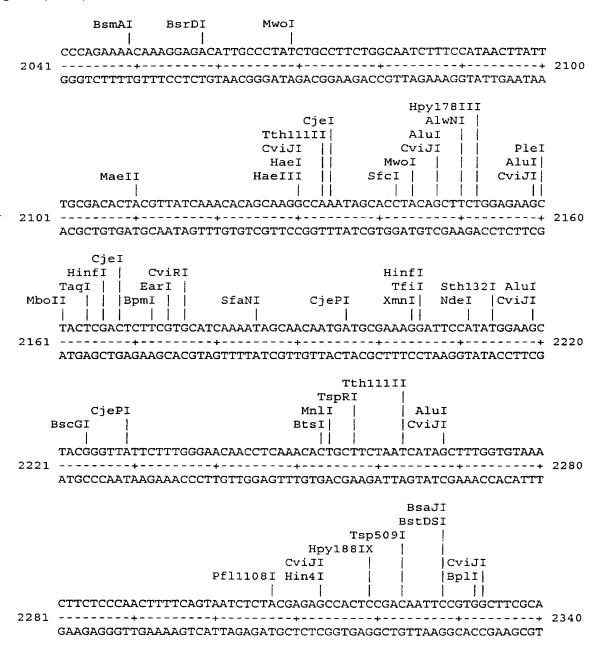
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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 20 (con't)

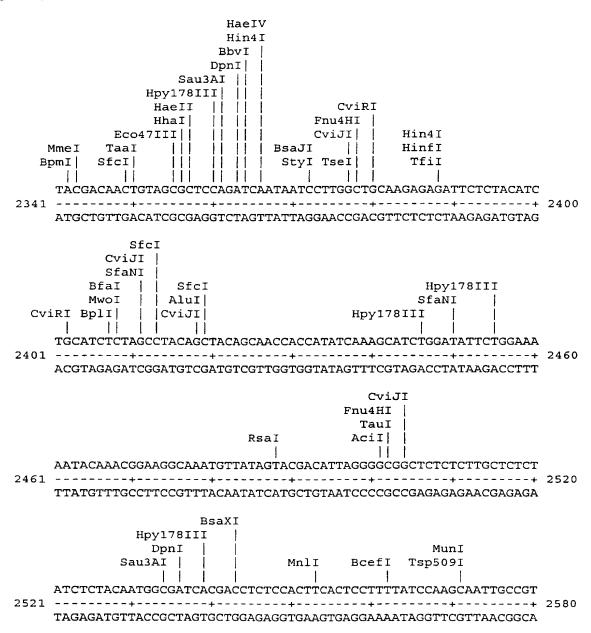


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Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

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Fig. 20 (con't)

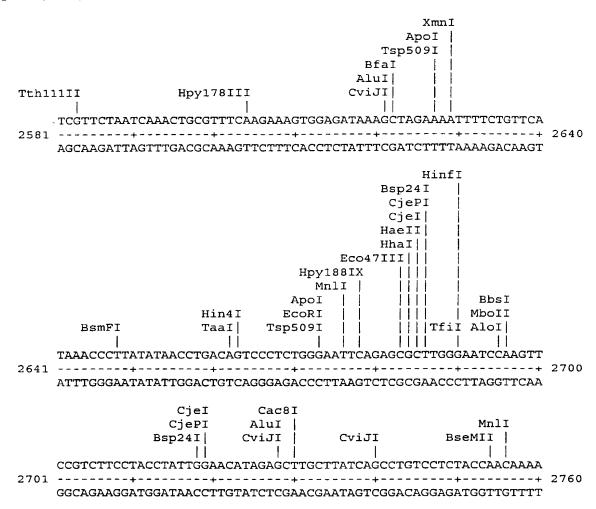


DOCKET NO.: 032931/0251

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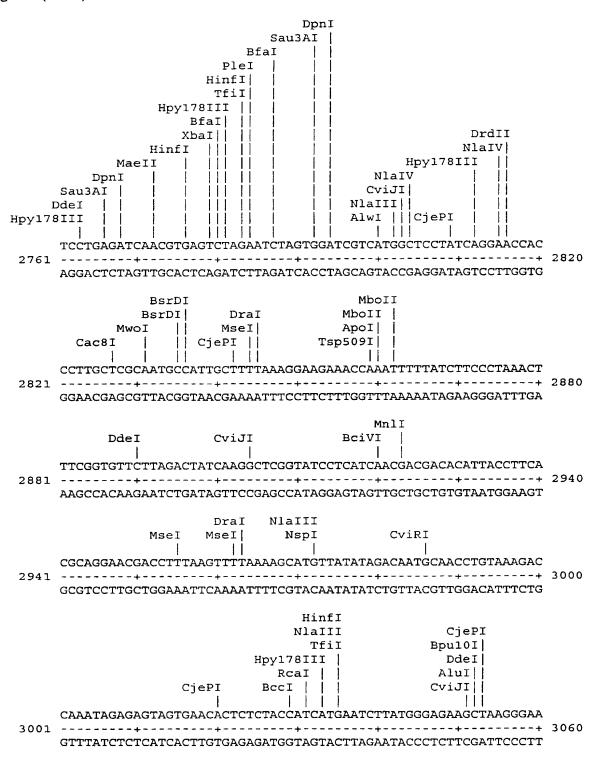


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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 20 (con't)



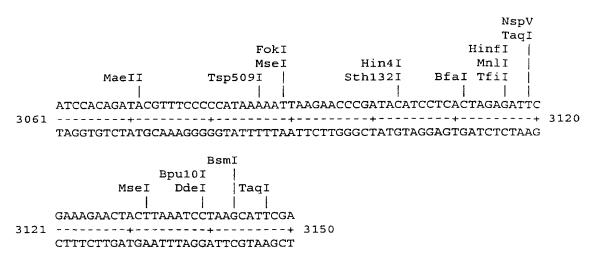
Title: CHLAMYDIA ANTIGENS AND TOTAL 1 1 097830446

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 20 (con't)



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Figure 21A: CPN100626 Coding Sequence

	cactcgaaat					
tgtgacctac	aatgctttag	ggatcaaagt	gaaaaatacc	atgcaggtgt	ttcctaaagt	120
	ttagattact					
	agaatgagat					
	aagactcctc					
gttcgggatg	actcctgcag	tgtatagttt	acaaacggac	tcccttgaaa	agtttgcttt	360
agagagggat	gaagagtttc	gtacgagctt	tcctctctta	gactctctct	ccactcttac	420
	ccaataacta					
	tacaagtcta					
	aataatttct					
	gggactggag					
	cttatttttt					
aactcgtggg	ggtgcgattg	cctgtaatgg	agacttcacg	atttctcaaa	atcaagggac	780
	gtcaacaatt					
ctgccgcatc	caaagcaaca	gggcacctct	actcttttt	aacaatacag	cccctagtgg	900
	cttcgtagtg					
taagaacaac	tgtgggaaca	atggcggggc	cattcaaaca	agcgttactg	ttgcgataaa	1020
aaataactcc	gggtcggtga	ttttcaataa	caacacagcg	ttatctggtt	cgataaattc	1080
aggaaatggt	tcaggagggg	cgatttatac	aacaaaccta	tccatagacg	ataaccctgg	1140
aactattctt	ttcaataata	actactgcat	tcgcgatggc	ggagctatct	gtacacaatt	1200
tttgacaatc	aaaaatagtg	gccacgtata	tttcaccaac	aatcaaggaa	actggggagg	1260
	ctcctacagg					
	aatgaggttt					
	aacttacaac					
	caacatccaa					
_	ttattttctt					
	tcgaaaaata					
	caattctata					
ggcgagtatt	gcaacaactg	ccaactctga	gactccatca	actagtgtag	gctcccaggt	1740
	aaccttgcga					
	cgtcctctac					
	ggtcctctga					
	gagcctttac					
	accgataact					
	tggtctcctt					
	aacaccctct					
	gaataccaag					
	ctattaagaa					
	caagggattg					
	cgtatccaat					
	atctccttag					
	gtctcggctc					
	tttgcaacat					
	cgtcacatca					
	ggctgttctt					
	attgcaatac					
	gtctctcaaa					
	tcaaaattcc	_	_			
	caacaaaatc			_		
	ggccataact					
	cgttctctcg					
	catctccaag					
	ttagaattaa					
	atttaaataa		. 5 . 5 5		- 55 5 - 5 5	3200

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 21B: CPN100626 Deduced Amino Acid Sequence

Met 1	Gln	Val	Phe	Pro 5	Lys	Val	Thr	Leu	Ser 10	Leu	Asp	Tyr	Ser	Ala 15	Asp
Ile	Ser	Ser	Ser 20	Thr	Leu	Ser	His	Tyr 25	Leu	Asn	Val	Ala	Ser 30	Arg	Met
Arg	Phe	Leu 35	Thr	Ile	Ser	Asp	Gln 40	Asn	Arg	Lys	Ile	Lys 45	Glu	Pro	Leu
Val	Ser 50	Lys	Thr	Pro	Pro	Lys 55	Phe	Leu	Phe	Tyr	Leu 60	Gly	Asn	Phe	Thr
Ala 65	Cys	Met	Phe	Gly	Met 70	Thr	Pro	Ala	Val	Tyr 75	Ser	Leu	Gln	Thr	Asp 80
Ser	Leu	Glu	Lys	Phe 85	Ala	Leu	Glu	Arg	Asp 90	Glu	Glu	Phe	Arg	Thr 95	Ser
Phe	Pro	Leu	Leu 100	Asp	Ser	Leu	Ser	Thr 105	Leu	Thr	Gly	Phe	Ser 110	Pro	Ile
Thr	Thr	Phe 115	Val	Gly	Asn	Arg	His 120	Asn	Ser	Ser	Gln	Asp 125	Ile	Val	Leu
Ser	Asn 130	Tyr	Lys	Ser	Ile	Asp 135	Asn	Ile	Leu	Leu	Leu 140	Trp	Thr	Ser	Ala
Gly 145	Gly	Ala	Val	Ser	Cys 150	Asn	Asn	Phe	Leu	Leu 155	Ser	Asn	Val	Glu	Asp 160
His	Ala	Phe	Phe	Ser 165	Lys	Asn	Leu	Ala	Ile 170	Gly	Thr	Gly	Gly	Ala 175	Ile
Ala	Cys	Gln	Gly 180	Ala	Cys	Thr	Ile	Thr 185	Lys	Asn	Arg	Gly	Pro 190	Leu	Ile
Phe	Phe	Ser 195	Asn	Arg	Gly	Leu	Asn 200	Asn	Ala	Ser	Thr	Gly 205	Gly	Glu	Thr
Arg	Gly 210	Gly	Ala	Ile	Ala	Cys 215	Asn	Gly	Asp	Phe	Thr 220	Ile	Ser	Gln	Asn
Gln 225	Gly	Thr	Phe	Tyr	Phe 230	Val	Asn	Asn	Ser	Val 235	Asn	Asn	Trp	Gly	Gly 240
Ala	Leu	Ser	Thr	Asn 245	Gly	His	Cys	Arg	Ile 250	Gln	Ser	Asn	Arg	Ala 255	Pro
Leu	Leu	Phe	Phe 260	Asn	Asn	Thr	Ala	Pro 265	Ser	Gly	Gly	Gly	Ala 270	Leu	Arg
Ser	Glu	Asn 275	Thr	Thr	Ile	Ser	Asp 280	Asn	Thr	Arg	Pro	Ile 285	Tyr	Phe	Lys

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Fig. 21B (con't)

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Asn	Asn 290	Cys	Gly	Asn	Asn	Gly 295	Gly	Ala	Ile	Gln	Thr 300	Ser	Val	Thr	Val
Ala 305	Ile	Lys	Asn	Asn	Ser 310	Gly	Ser	Val	Ile	Phe 315	Asn	Asn	Asn	Thr	Ala 320
Leu	Ser	Gly	Ser	Ile 325	Asn	Ser	Gly	Asn	Gly 330	Ser	Gly	Gly	Ala	Ile 335	Tyr
Thr	Thr	Asn	Leu 340	Ser	Ile	Asp	Asp	Asn 345	Pro	Gly	Thr	Ile	Leu 350	Phe	Asn
Asn	Asn	Tyr 355	Cys	Ile	Arg	Asp	Gly 360	Gly	Ala	Ile	Cys	Thr 365	Gln	Phe	Leu
Thr	Ile 370	Lys	Asn	Ser	Gly	His 375	Val	Tyr	Phe	Thr	Asn 380	Asn	Gln	Gly	Asn
Trp 385	Gly	Gly	Ala	Leu	Met 390	Leu	Leu	Gln	Asp	Ser 395	Thr	Cys	Leu	Leu	Phe 400
Ala	Glu	Gln	Gly	Asn 405	Ile	Ala	Phe	Gln	Asn 410	Asn	Glu	Val	Phe	Leu 415	Thr
Thr	Phe	Gly	Arg 420	Tyr	Asn	Ala	Ile	His 425	Cys	Thr	Pro	Asn	Ser 430	Asn	Leu
Gln	Leu	Gly 435	Ala	Asn	Lys	Gly	Tyr 440	Thr	Thr	Ala	Phe	Phe 445	Asp	Pro	Ile
Glu	His 450	Gln	His	Pro	Thr	Thr 455	Asn	Pro	Leu	Ile	Phe 460	Asn	Pro	Asn	Ala
Asn 465	His	Gln	Gly	Thr	Ile 470	Leu	Phe	Ser	Ser	Ala 475	Tyr	Ile	Pro	Glu	Ala 480
Ser	Asp	Tyr	Glu	Asn 485	Asn	Phe	Ile	Ser	Ser 490	Ser	Lys	Asn	Thr	Ser 495	Glu
Leu	Arg	Asn	Gly 500	Val	Leu	Ser	Ile	Glu 505	Asp	Arg	Ala	Gly	Trp 510	Gln	Phe
Tyr	Lys	Phe 515	Thr	Gln	Lys	Gly	Gly 520	Ile	Leu	Lys	Leu	Gly 525	His	Ala	Ala
Ser	Ile 530	Ala	Thr	Thr	Ala	Asn 535	Ser	Glu	Thr	Pro	Ser 540	Thr	Ser	Val	Gly
Ser 545	Gln	Val	Ile	Ile	Asn 550	Asn	Leu	Ala	Ile	Asn 555	Leu	Pro	Ser	Ile	Leu 560
Ala	Lys	Gly	Lys	Ala 565	Pro	Thr	Leu	Trp	Ile 570	Arg	Pro	Leu	Gln	Ser 575	Ser

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Ala	Pro	Phe	Thr 580	Glu	Asp	Asn	Asn	Pro 585		Ile	Thr	Leu	Ser 590	-	Pro
Leu	Thr	Leu 595	Leu	Asn	Glu	Glu	Asn 600	Arg	Asp	Pro	Tyr	Asp 605	Ser	Ile	Asp
Leu	Ser 610	Glu	Pro	Leu	Gln	Asn 615	Ile	His	Leu	Leu	Ser 620	Leu	Ser	Asp	Val
Thr 625	Ala	Arg	His	Ile	Asn 630	Thr	Asp	Asn	Phe	His 635	Pro	Glu	Ser	Leu	Asn 640
Ala	Thr	Glu	His	Tyr 645	Gly	Tyr	Gln	Gly	Ile 650	Trp	Ser	Pro	Tyr	Trp 655	Val
Glu	Thr	Ile	Thr 660	Thr	Thr	Asn	Asn	Ala 665	Ser	Ile	Glu	Thr	Ala 670	Asn	Thr
Leu	Tyr	Arg 675	Ala	Leu	Tyr	Ala	Asn 680	Trp	Thr	Pro	Leu	Gly 685	Tyr	Lys	Val
Asn	Pro 690	Glu	Tyr	Gln	Gly	Asp 695	Leu	Ala	Thr	Thr	Pro 700	Leu	Trp	Gln	Ser
Phe 705	His	Thr	Met	Phe	Ser 710	Leu	Leu	Arg	Ser	Tyr 715	Asn	Arg	Thr	Gly	Asp 720
Ser	Asp	Ile	Glu	Arg 725	Pro	Phe	Leu	Glu	Ile 730	Gln	Gly	Ile	Ala	Asp 735	Gly
Leu	Phe	Val	His 740	Gln	Asn	Ser	Ile	Pro 745	Gly	Ala	Pro	Gly	Phe 750	Arg	Ile
Gln	Ser	Thr 755	Gly	Tyr	Ser	Leu	Gln 760	Ala	Ser	Ser	Glu	Thr 765	Ser	Leu	His
Gln	Lys 770	Ile	Ser	Leu	Gly	Phe 775	Ala	Gln	Phe	Phe	Thr 780	Arg	Thr	Lys	Glu
Ile 785	Gly	Ser	Ser	Asn	Asn 790	Val	Ser	Ala	His	Asn 795	Thr	Val	Ser	Ser	Leu 800
Tyr	Val	Glu	Leu	Pro 805	Trp	Phe	Gln	Glu	Ala 810	Phe	Ala	Thr	Ser	His 815	Ser
Leu	Ala	Tyr	Gly 820	Tyr	Gly	Asp	His	His 825	Leu	His	Ala	Tyr	Ile 830	Arg	His
Ile	Lys	Asn 835	Arg	Ala	Glu	Gly	Thr 840	Cys	Tyr	Ser	His	Thr 845	Leu	Ala	Ala
Ala	Ile 850	Gly	Cys	Ser	Phe	Pro 855	Trp	Gln	Gln	Lys	Ser 860	Tyr	Leu	His	Leu

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Fia.	21B	(con't)
		100,

Ser 865	Pro	Phe	Val	Gln	Ala 870	Ile	Ala	Ile	Arg	Ser 875	His	Gln	Thr	Ala	Phe 880
Glu	Glu	Ile	Gly	Asp 885	Asn	Pro	Arg	Lys	Phe 890	Val	Ser	Gln	Lys	Pro 895	Phe
Tyr	Asn	Leu	Thr 900	Leu	Pro	Leu	Gly	Ile 905	Gln	Gly	Lys	Trp	Gln 910	Ser	Lys
Phe	His	Val 915	Pro	Thr	Glu	Trp	Thr 920	Leu	Glu	Leu	Ser	Tyr 925	Gln	Pro	Val
Leu	Tyr 930	Gln	Gln	Asn	Pro	Gln 935	Ile	Gly	Val	Thr	Leu 940	Leu	Ala	Ser	Gly
Gly 945	Ser	Trp	Asp	Ile	Leu 950	Gly	His	Asn	Tyr	Val 955	Arg	Asn	Ala	Leu	Gly 960
Tyr	Lys	Val	His	Asn 965	Gln	Thr	Ala	Leu	Phe 970	Arg	Ser	Leu	Asp	Leu 975	Phe
Leu	Asp	Tyr	Gln 980	Gly	Ser	Val	Ser	Ser 985	Ser	Thr	Ser	Thr	His 990	His	Leu
Gln	Ala	Gly 995	Ser	Thr	Leu		Phe 1000								

Title: CHLAMYDIA ANTIGENS AND SCHOOL OF 1830446 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

Figure 22 (RY-45) Restriction enzyme analysis of CPN100626

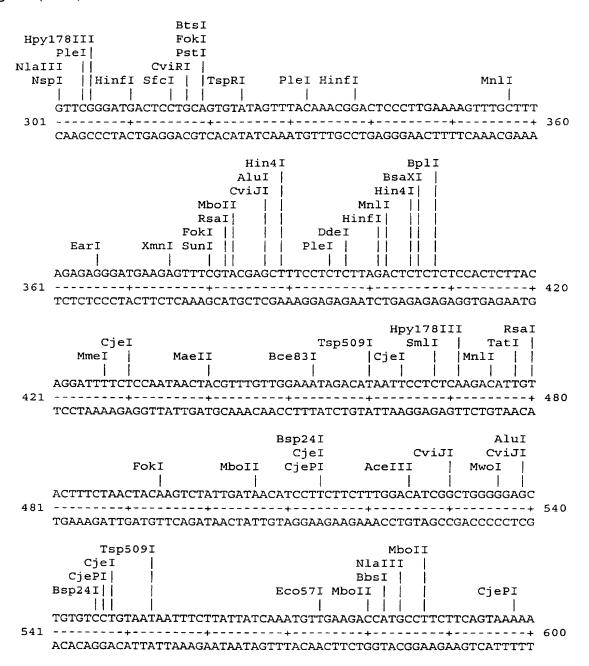
Msli Cjel Hgal Hgal CviJI BsaJI BsaAI Hael Tsp509I Styl Maell HaelII Hpy178III Taql Cjel CviJl Rsal Cac8I TCCTGAACTCCACTCGAAATTACTGATTAGCCAAGGTACGTGGACGACGCAGGCCACTC AGGACTTGAGGTGAGCTTTAATGACTAATCGGTTCCATGCACCTGCTGCGTCCGGTGAGGCACGCAGGCCACTCCACTTGAGGAG	+ 60
AarI MslI MaeIII DpnI BspMI CviRI MaeIII Tsp45I Sau3AI AlwI NlaIII Tsp45I	+ 120
MaeIII BseMII Tsp45I Bsp24I HinfI MaeII MboII CjePI MnlI MseI DdeI AciI CjeI DdeI PleI CACTCTCTCCTTAGATTACTCTGCGGATATTTCTTCCTCCACGCTGAGTCACTTAAA 121	\ \ - 180
CjeI CjePI MaeIII Bsp24I MseI Tsp45I MseI NlaIV	240
HinfI MnlI Apol CviRI PleI Tsp509I Cac8I BseRI Sth132I Hpy178III Sth132I BfaI DdeI MnlI AvaI CviJI TCTAGTGTCAAAGACTCCTCCTAAGTTTTTATTCTATCTCGGGAATTTCACAGCCTGCACCACCACCACCACCACCACCACCACCACCACCACCAC	r - 300

Title: CHLAMYDIA ANTIGENS AND 1011 097830446 CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

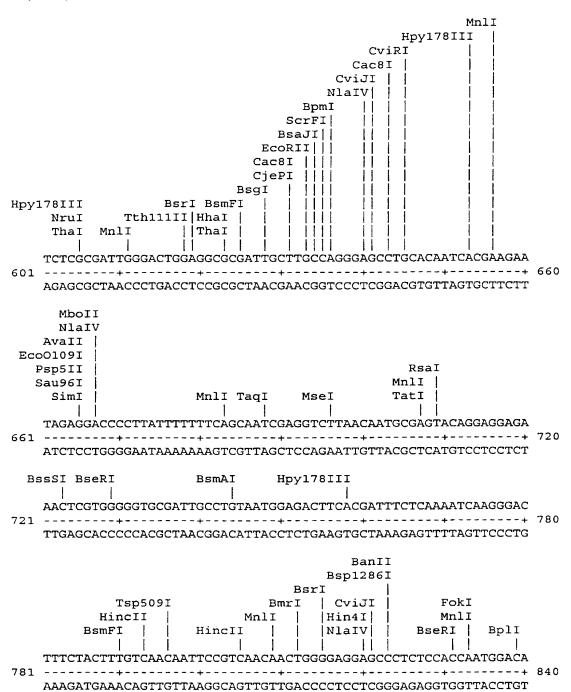
PCT/CA99/00992

Fig. 22 (con't)



Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

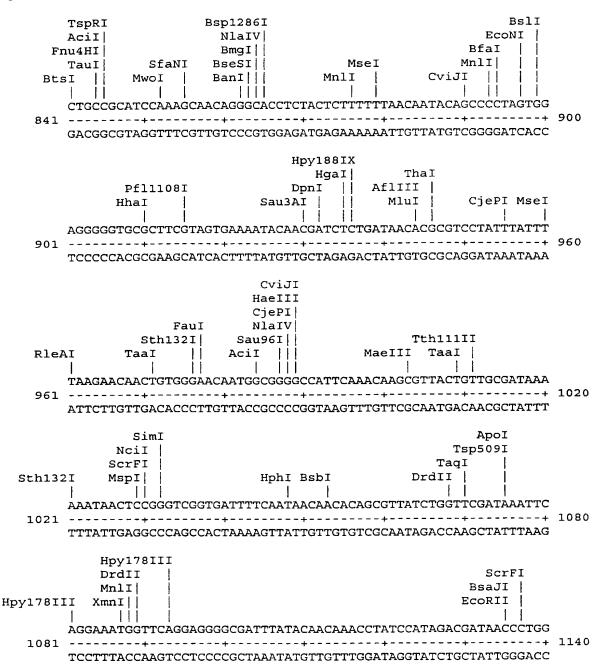
Fig. 22 (con't)



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 PCT/CA99/00992

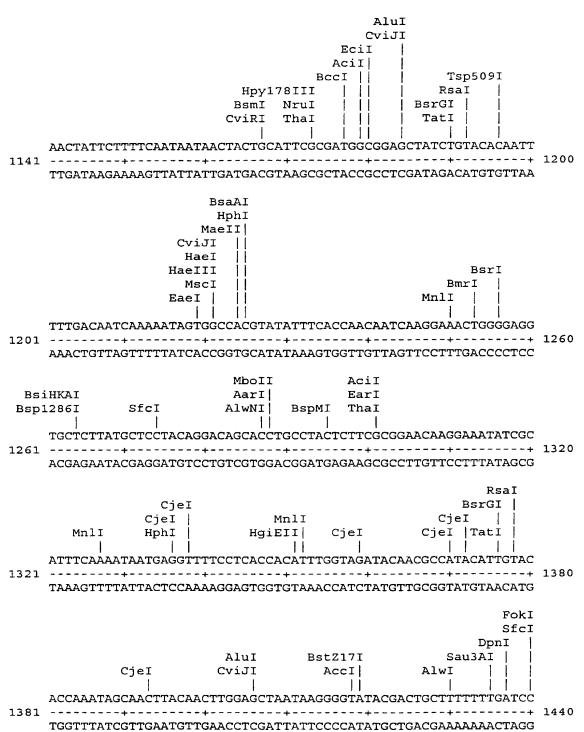


AND USES THEREOF

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

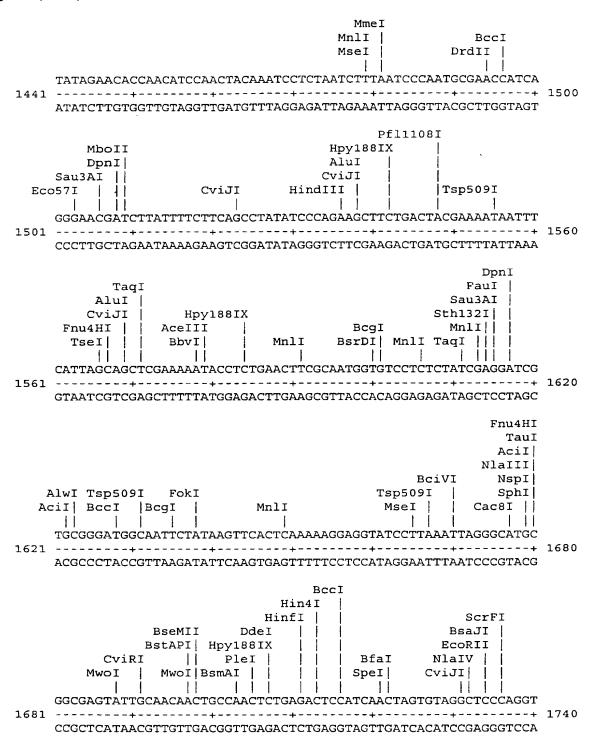


Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

DOCKET NO.: 032931/0251

PCT/CA99/00992

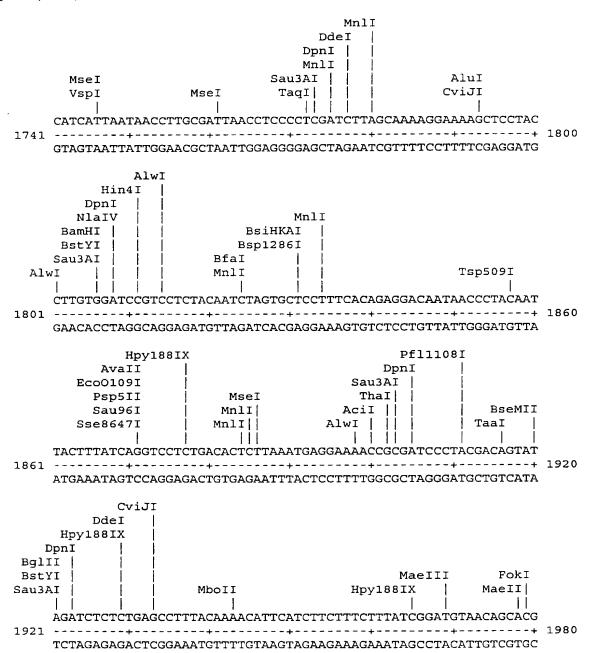
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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 22 (con't)



AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 22 (con't)

BseMII	
MseI	
AluI	
CviJI	
HindIII	
FokI Hpy178III DdeI TaaI	
TCATATCAATACCGATAACTTTCATCCTGAAAGCTTAAATGCGACTGAGCATTACGGTTA	
1981	2040
AGTATAGTTATGGCTATTGAAAGTAGGACTTTCGAATTTACGCTGACTCGTAATGCCAAT	
BsmAI	
BsaI SfcI	
BsmAI BsmAI	
SfaNI BsmBI BsmBI	
TCAAGGCATCTGGTCTCCTTATTGGGTAGAGACGATAACAACAACAAATAACGCTTCTAT	
	2100
AGTTCCGTAGACCAGAGGAATAACCCATCTCTGCTATTGTTGTTGTTATTGCGAAGATA	
BanII	
BsiHKAI	
Bsp1286I	
CjePI	
SacI	
AluI	
CviJI	
Mnli Muni	
Tth111II PleI	
BcefI Tsp509I Bsu36I HaeIV	
SfcI MwoI HinfI DdeI Hin4I	
AGAGACGGCAAACACCCTCTACAGAGCTCTGTATGCCAATTGGACTCCCTTAGGATATAA	2160
2101+ TCTCTGCCGTTTGTGGGAGATGTCTCGAGACATACGGTTAACCTGAGGGAATCCTATATT	2160
TCTCTGCCGTTTGTGGGAGATGTCTCGAGACATACGGTTAACCTGAGGGAATCCTATATT	
Daw T	
DpnI	
BglII BstYI	
Sau3AI HinfI	
Hpy178III BsaJI Pfll108I	
CjePI StyI PleI	
2161+	2220
	2220

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 22 (con't)

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2221	 CCTCTATTAAGAAGTTATA	T Hp EcoR MnlI Hpy188IX HinfI TfiI IqI BsrI		2280
2281	-+	, (AvaI	2340
Hae HinfI TfiI ScrFI BanII sp1286I EcoRII TCCAGGAT	A4I BciVI SfcI Fc	oki Hpy18 GGGTATTCCTTACAAGCATC	CTCCGAAACTTCTTT	2400

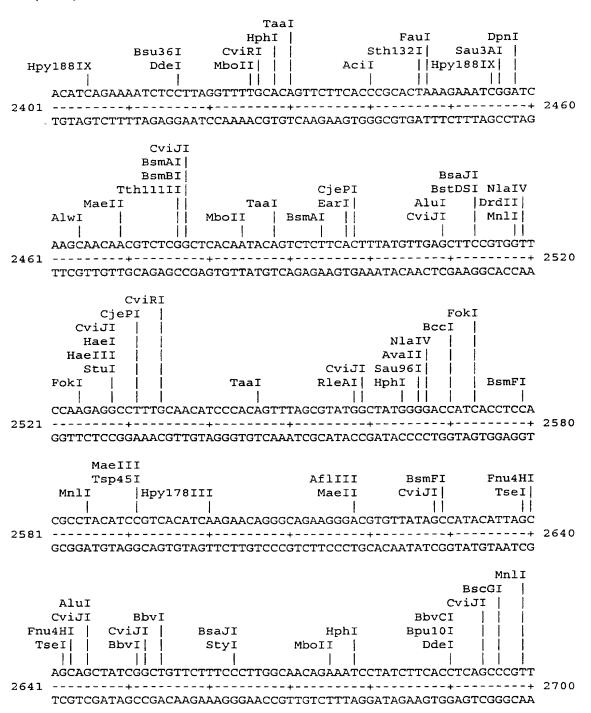
AGGTCCTAAGGCATAGGTTAGATGTCCCATAAGGAATGTTCGTAGGAGGCTTTGAAGAAA

Title: CHLAMYDIA ANTIGENS AND SUMMED OF PROPERTY OF THE OFFICE OFFICE OF

CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

WO 00/24765 Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

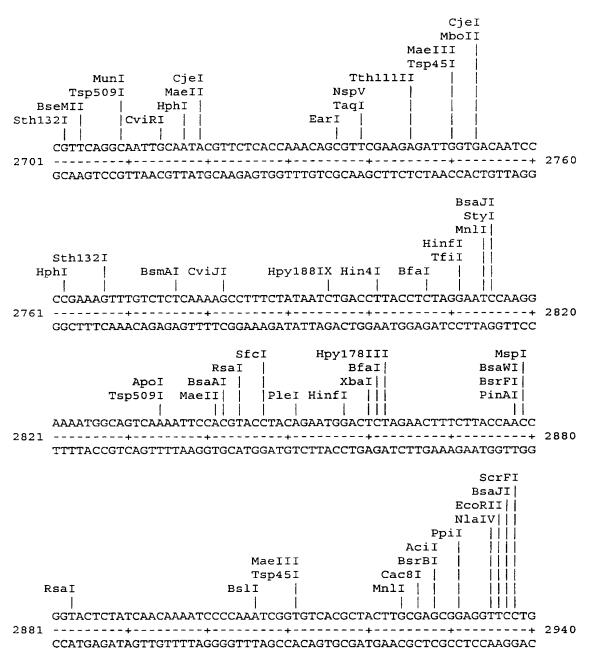


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CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

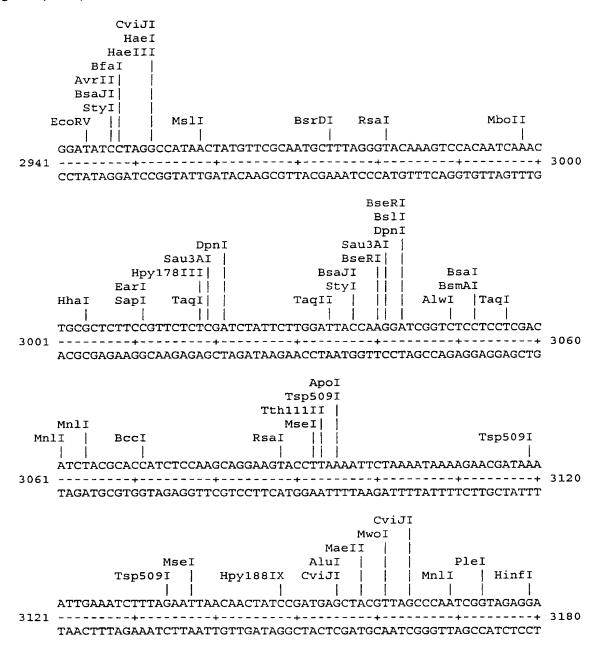
PCT/CA99/00992



WO 00/24765

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

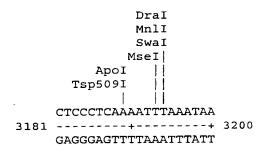


Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA ERACO CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 22 (con't)



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

WO 00/24765

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Figure 23:

taga	acact	cat a	aaaa	caaat	t a	tagad	caaaa	a aat	ctag	gcat	tgai	ttai	ttc a	agaat	tatttc	60
ttt	ctatt	tg t	gaad	cgagt	a to	geget	tttt	t ttq	gctto	egga				cct Pro		115
act Thr	ttt Phe	gta Val	ttg Leu	gct Ala 10	aat Asn	gaa Glu	ggt Gly	ctc Leu	caa Gln 15	ctt Leu	cct Pro	ttg Leu	gag Glu	acc Thr 20	tat Tyr	163
att Ile	aca Thr	tta Leu	agt Ser 25	cct Pro	gaa Glu	tat Tyr	caa Gln	gca Ala 30	gcc Ala	cct Pro	caa Gln	gta Val	35 35	ttt Phe	act Thr	211
									gtc Val							259
atc Ile	ttg Leu 55	gac Asp	tat Tyr	aag Lys	tac Tyr	tat Tyr 60	cgg Arg	tcg Ser	aat Asn	gga Gly	ggt Gly 65	gct Ala	ctt Leu	acc Thr	tgt Cys	307
aag Lys 70	aat Asn	ctt Leu	ctg Leu	atc Ile	tct Ser 75	gaa Glu	aat Asn	ata Ile	Gly ggg	aat Asn 80	gtc Val	ttc Phe	ttt Phe	gag Glu	aag Lys 85	355
aat Asn	gtc Val	tgt Cys	ccc Pro	aat Asn 90	tct Ser	ggc Gly	gjà aaa	gca Ala	att Ile 95	tat Tyr	gct Ala	gct Ala	caa Gln	aat Asn 100	tgc Cys	403
									ttt Phe							451
									cta Leu							499
									cta Leu							547
gac Asp 150	aat Asn	ctc Leu	gct Ala	tta Leu	aat Asn 155	aag Lys	Gly aaa	ggt Gly	gcc Ala	ctc Leu 160	tat Tyr	act Thr	gag Glu	acg Thr	aac Asn 165	595
									atc Ile 175							643
									gly ggg							691

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 23 (con't)

9.			,													
cta Leu	aat Asn	ata Ile 200	gag Glu	gga Gly	aat Asn	tct Ser	gga Gly 205	gct Ala	ata Ile	cag Gln	atc Ile	aca Thr 210	agc Ser	aac Asn	tct Ser	739
tca Ser	gga Gly 215	tct Ser	GJÀ aaa	gga Gly	ggc Gly	ata Ile 220	ttt Phe	tct Ser	acc Thr	caa Gln	aca Thr 225	ctc Leu	acg Thr	atc Ile	tcc Ser	787
tcg Ser 230	aat Asn	aaa Lys	aaa Lys	ctc Leu	ata Ile 235	gaa Glu	atc Ile	agt Ser	gaa Glu	aat Asn 240	tcc Ser	gcg Ala	ttc Phe	gca Ala	aat Asn 245	835
aac Asn	tat Tyr	gga Gly	tcg Ser	aac Asn 250	ttc Phe	aat Asn	cca Pro	gga Gly	gga Gly 255	gga Gly	ggt Gly	ctt Leu	act Thr	acc Thr 260	acc Thr	883
ttt Phe	tgc Cys	acg Thr	ata Ile 265	ttg Leu	aac Asn	aac Asn	cga Arg	gaa Glu 270	Gly 999	gta Val	ctc Leu	ttt Phe	aac Asn 275	aat Asn	aac Asn	931
caa Gln	agc Ser	cag Gln 280	agc Ser	aac Asn	ggt Gly	gga Gly	gcc Ala 285	att Ile	cat His	gcg Ala	aaa Lys	tct Ser 290	atc Ile	att Ile	atc Ile	979
aaa Lys	gaa Glu 295	aat Asn	ggt Gly	cct Pro	gta Val	tac Tyr 300	ttt Phe	tta Leu	aat Asn	aac Asn	act Thr 305	gca Ala	act Thr	cgg Arg	gga Gly	1027
310 310	gct Ala	ctc Leu	ctc Leu	aac Asn	tta Leu 315	tca Ser	gca Ala	ggt Gly	tct Ser	gga Gly 320	aac Asn	gga Gly	agc Ser	ttc Phe	atc Ile 325	1075
tta Leu	tct Ser	gca Ala	gat Asp	aat Asn 330	gga Gly	gat Asp	att Ile	atc Ile	ttt Phe 335	aac Asn	aat Asn	aat Asn	acg Thr	gcc Ala 340	tcc Ser	1123
aag Lys	cat His	gcc Ala	ctc Leu 345	aat Asn	cct Pro	cca Pro	tac Tyr	aga Arg 350	aac Asn	gcc Ala	att Ile	cac His	tcg Ser 355	act Thr	cct Pro	1171
aat Asn	atg Met	aat Asn 360	ctg Leu	caa Gln	ata Ile	gga Gly	gcc Ala 365	cgt Arg	ccc Pro	ggc Gly	tat Tyr	cga Arg 370	gtg Val	ctg Leu	ttc Phe	1219
tat Tyr	gat Asp 375	ccc Pro	ata Ile	gaa Glu	cat His	gag Glu 380	ctc Leu	cct Pro	tcc Ser	tcc Ser	ttc Phe 385	ccc Pro	ata Ile	ctc Leu	ttt Phe	1267
aat Asn 390	ttc Phe	gaa Glu	acc Thr	ggt Gly	cat His 395	aca Thr	ggt Gly	aca Thr	gtt Val	tta Leu 400	Phe	tca Ser	Gly aaa	gaa Glu	cat His 405	1315

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 23 (con't)

9.			•													
gta Val	cac His	cag Gln	aac Asn	ttt Phe 410	acc Thr	gat Asp	gaa Glu	atg Met	aat Asn 415	ttc Phe	ttt Phe	tcc Ser	tat Tyr	tta Leu 420	agg Arg	1363
aac Asn	act Thr	tcg Ser	gaa Glu 425	cta Leu	cgt Arg	caa Gln	gga Gly	gtc Val 430	ctt Leu	gct Ala	gtt Val	gaa Glu	gat Asp 435	ggt Gly	gcg Ala	1411
gly ggg	ctg Leu	gcc Ala 440	tgc Cys	tat Tyr	aag Lys	ttc Phe	ttc Phe 445	caa Gln	cga Arg	gga Gly	ggc Gly	act Thr 450	cta Leu	ctt Leu	cta Leu	1459
ggt Gly	caa Gln 455	ggt Gly	gcg Ala	gtg Val	atc Ile	acg Thr 460	aca Thr	gca Ala	gga Gly	acg Thr	att Ile 465	ccc Pro	aca Thr	cca Pro	tcc Ser	1507
tca Ser 470	aca Thr	cca Pro	acg Thr	aca Thr	gta Val 475	gga Gly	agt Ser	act Thr	ata Ile	act Thr 480	tta Leu	aat Asn	cac His	att Ile	gcc Ala 485	1555
att Ile	gac Asp	ctt Leu	cct Pro	tct Ser 490	att Ile	ctt Leu	tct Ser	ttt Phe	caa Gln 495	gct Ala	cag Gln	gct Ala	cca Pro	aaa Lys 500	att Ile	1603
tgg Trp	att Ile	tac Tyr	ccc Pro 505	aca Thr	aaa Lys	aca Thr	gga Gly	tct Ser 510	acc Thr	tat Tyr	act Thr	gaa Glu	gat Asp 515	tcc Ser	aac Asn	1651
											cgc Arg					1699
											tct Ser 545					1747
ccc Pro 550	ctt Leu	ctt Leu	tat Tyr	att Ile	gtc Val 555	gat Asp	gtc Val	gct Ala	gca Ala	caa Gln 560	aaa Lys	att Ile	aac Asn	tct Ser	tcg Ser 565	1 7 95
											cac His					1843
ggc Gly	atc Ile	tgg Trp	tcg Ser 585	acc Thr	tat Tyr	tgg Trp	gta Val	gaa Glu 590	act Thr	aca Thr	aca Thr	atc Ile	acg Thr 595	aac Asn	cct Pro	1891
											ctg Leu					1939

Title: CHLAMYDIA ANTIGENS AND
CORRESPONDING DNA FRAGMENTS
AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

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Fig. 23 (con't)

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tgg Trp	tct Ser 615	cct Pro	cta Leu	ggc Gly	tac Tyr	cgt Arg 620	cct Pro	cat His	ccc Pro	gaa Glu	cgt Arg 625	cga Arg	gga Gly	gaa Glu	ttc Phe	1987
att Ile 630	acg Thr	aat Asn	gcc Ala	ttg Leu	tgg Trp 635	caa Gln	tcg Ser	gca Ala	tat Tyr	acg Thr 640	gct Ala	ctt Leu	gca Ala	gga Gly	ctc Leu 645	2035
cac His	tcc Ser	ctc Leu	tcc Ser	tcc Ser 650	tgg Trp	gat Asp	gaa Glu	gag Glu	aag Lys 655	ggt Gly	cat His	gca Ala	gct Ala	tcc Ser 660	cta Leu	2083
	ggc Gly															2131
gga Gly	ttt Phe	cgt Arg 680	agt Ser	cat His	atg Met	aca Thr	ggt Gly 685	tat Tyr	agt Ser	gct Ala	acc Thr	acc Thr 690	gaa Glu	gca Ala	acc Thr	2179
tct Ser	tct Ser 695	caa Gln	agt Ser	ccg Pro	aat Asn	ttc Phe 700	tct Ser	tta Leu	gga Gly	ttt Phe	gct Ala 705	cag Gln	ttc Phe	ttc Phe	tcc Ser	2227
	gct Ala															2275
ttc Phe	tct Ser	gga Gly	atg Met	tgc Cys 730	ata Ile	gca Ala	aaa Lys	tac Tyr	tct Ser 735	ctt Leu	caa Gln	aga Arg	gtg Val	ata Ile 740	cgt Arg	2323
	tct Ser															2371
	tat Tyr															2419
	acc Thr 775															2467
	gag Glu															2515
	aat Asn															2563

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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig.	23	(con'	t)
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1.9. 20 (00.1.1)										
tcc cta cac cgc ccc cta acg gac gtc tcc ctc cct gta gga atc Ser Leu His Arg Pro Leu Thr Asp Val Ser Leu Pro Val Gly Ile 825 830 835	cgc 2611 Arg									
gct tct tgg aag aac cac cac cga gtt ccc cta gtc tgg ctc aca Ala Ser Trp Lys Asn His His Arg Val Pro Leu Val Trp Leu Thr 840 845 850	gaa 2659 Glu									
att tcc tat cgc tct act ctc tat agg caa gat cct gaa ctc cac Ile Ser Tyr Arg Ser Thr Leu Tyr Arg Gln Asp Pro Glu Leu His 855 860 865	tcg 2707 Ser									
aaa tta ctg att agc caa ggt acg tgg acg acg cag gcc act cct Lys Leu Leu Ile Ser Gln Gly Thr Trp Thr Thr Gln Ala Thr Pro 870 875 880	gtg 2755 Val 885									
acc tac aat gct tta ggg atc aaa gtg aaa aat acc atg cag gtg Thr Tyr Asn Ala Leu Gly Ile Lys Val Lys Asn Thr Met Gln Val 890 895 900	ttt 2803 Phe									
cct aaa gtc act ctc tcc tta gat tac tct gcg gat att tct tcc Pro Lys Val Thr Leu Ser Leu Asp Tyr Ser Ala Asp Ile Ser Ser 905 910 915	tcc 2851 Ser									
acg ctg agt cac tac tta aac gtg gcg agt aga atg aga ttt Thr Leu Ser His Tyr Leu Asn Val Ala Ser Arg Met Arg Phe 920 925 930	2893									
taacaataag tgaccaaaac agaaagatta aggaacctct agtgtcaaag actcctccta										
agtttttatt ctatctcggg aatttcacag cctgcatgtt cgggatg 3										

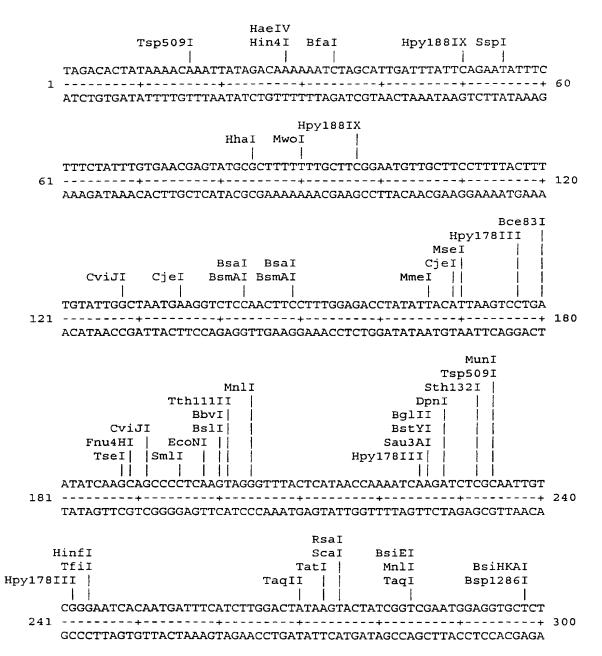
Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 04/830446

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Figure 24 (RY-46)

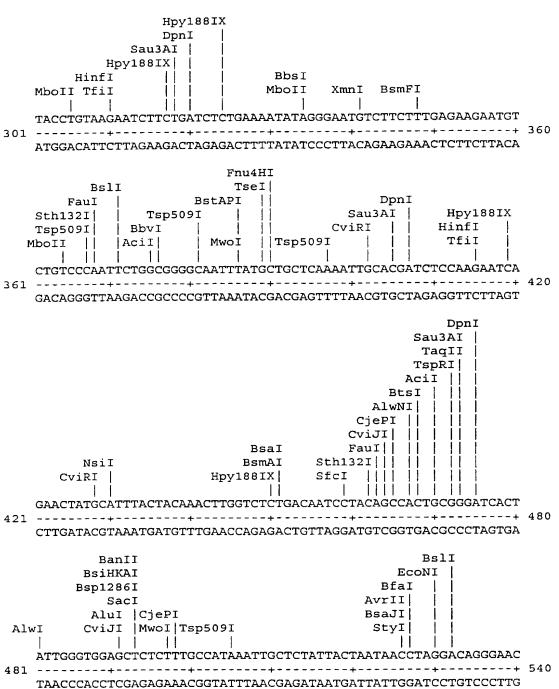
Restriction enzyme analysis of CPN100628



AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

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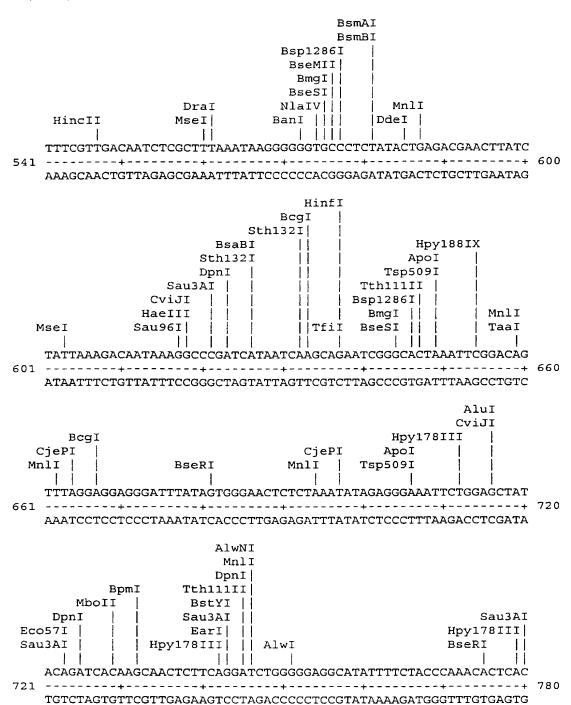
PCT/CA99/00992



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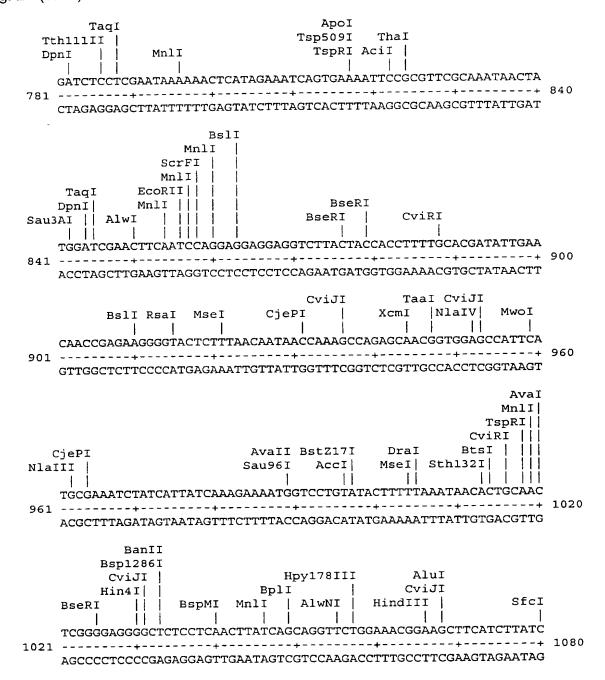
Fig. 24 (con't)



Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 24 (con't)

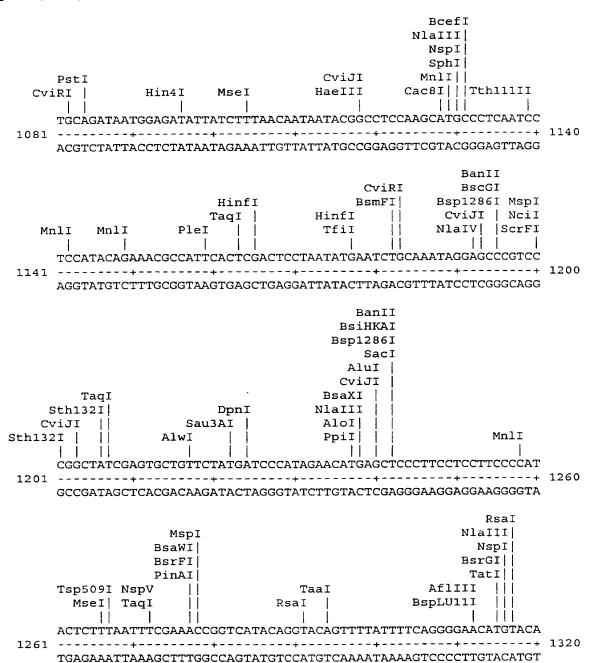


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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 24 (con't)

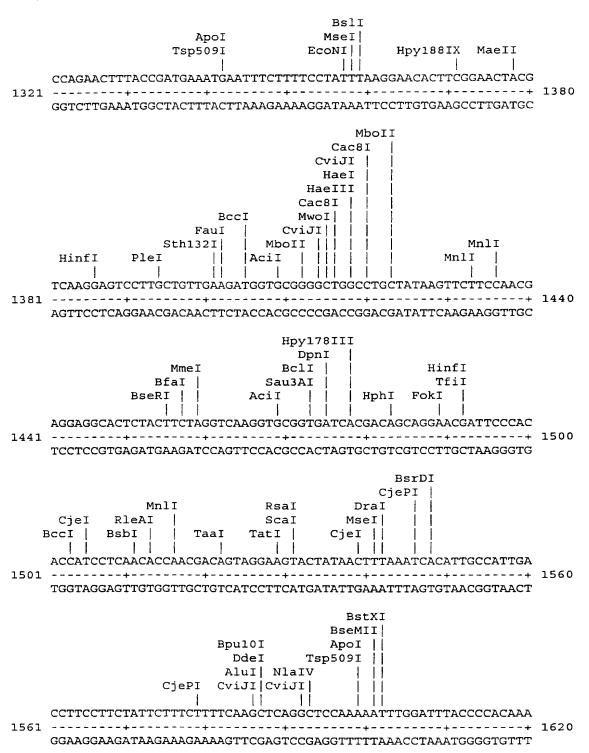


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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

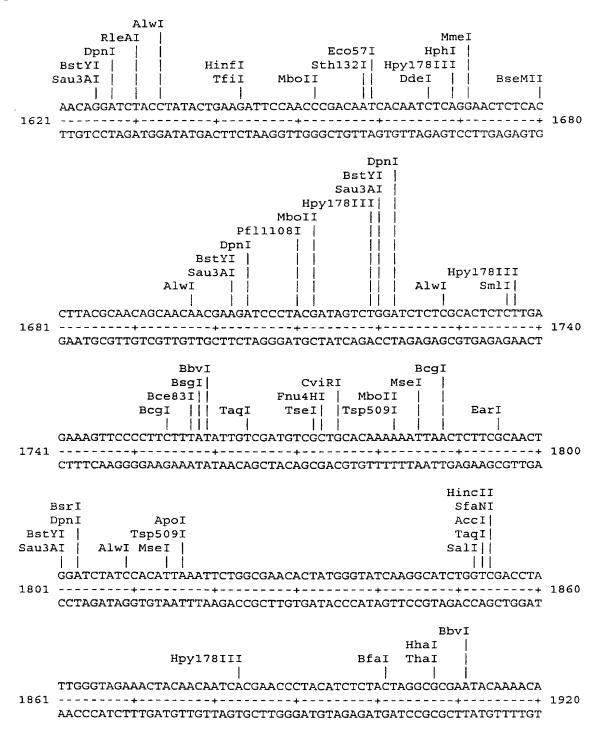
PCT/CA99/00992



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PCT/CA99/00992

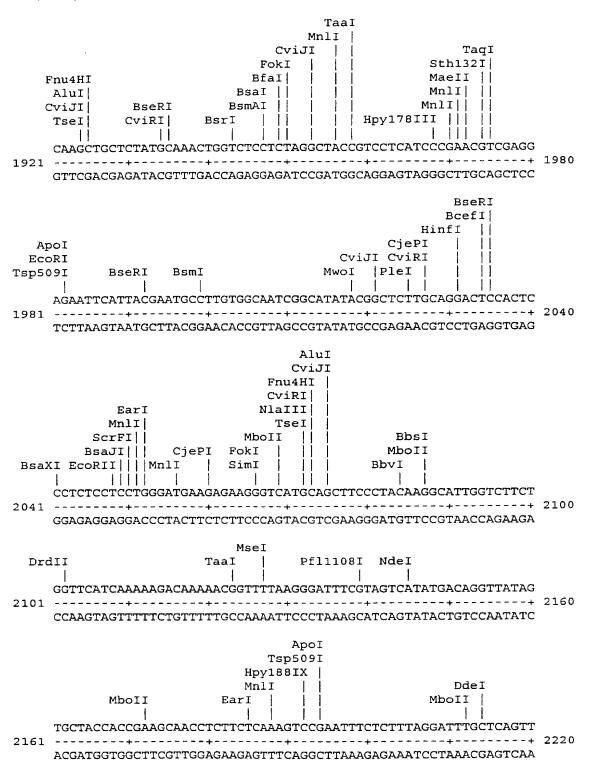
Fig. 24 (con't)



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Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

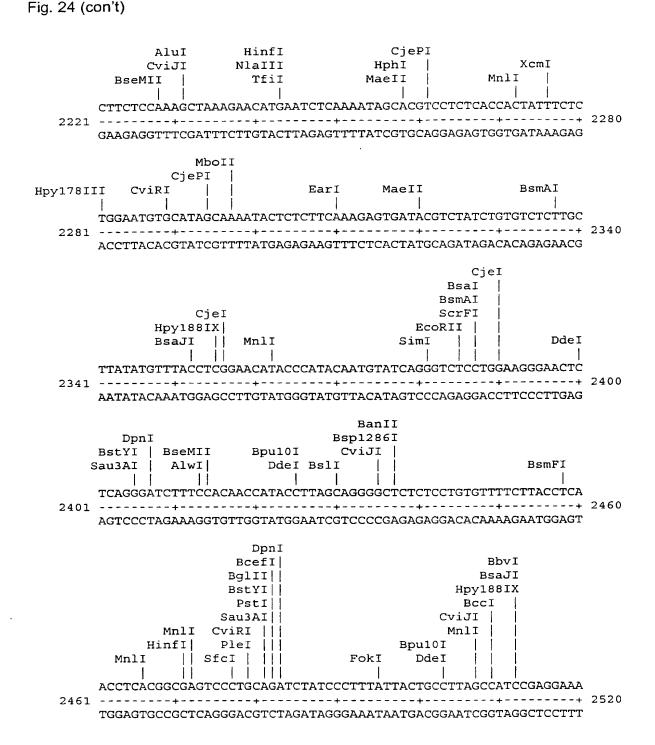


Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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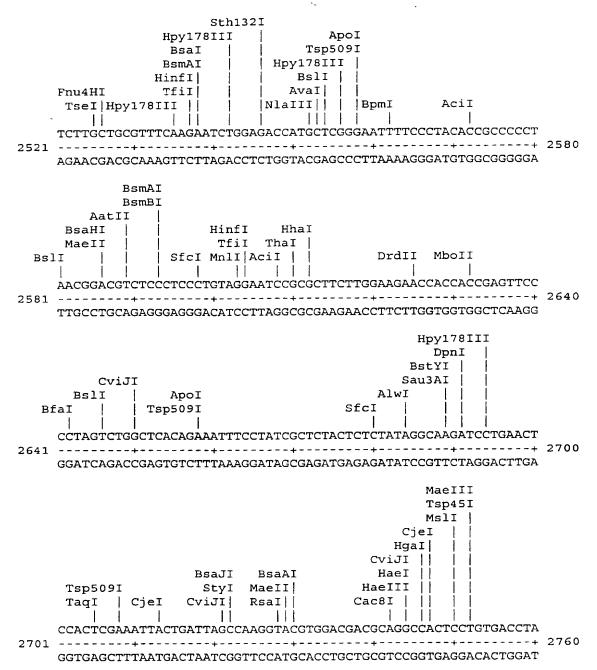


Title: CHLAMYDIA ANTIGENS AND STORE OF PROBLEM & CORRESPONDING DNA FRAGMENTS AND USES THEREOF.

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992



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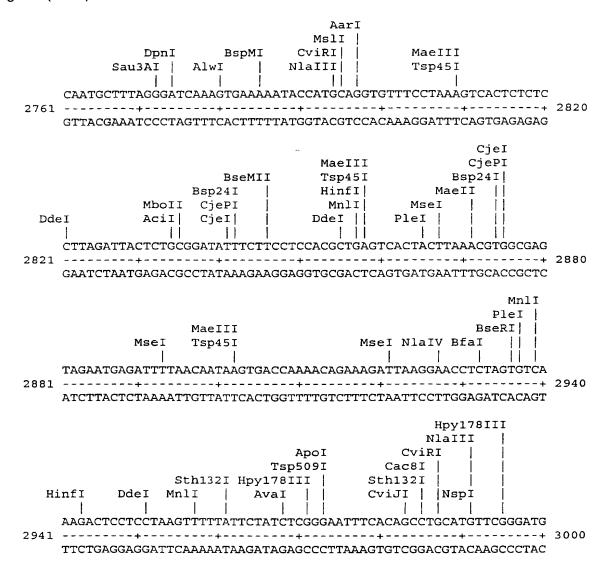
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

Fig. 24 (con't)



Title: CHLAMYDIA ANTIGENS AND SOLUTION OF THE CORRESPONDING DNA FRAGMENTS 09/830446

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

Figure 25:

cac	tgtg	gat	gtga	tatt	cg c	agaa	cctc	c cg	tcaa	atat	act	ctag	ata	tagg	jaagcaa	60
att	acga	ttt	taaa	cctt	at t	taac	gaca	a aa	ttga		_	cct Pro				114
					tgt Cys					Leu					•	162
		_			aga Arg						_				acg	210
	_		_		atc Ile					_		_	_			258
					ttt Phe											306
					aag Lys 75											354
					aac Asn											402
					tct Ser											450
					acc Ile											498
aaa Lys	gat Asp 135	ttg Leu	atc Ile	ttc Phe	act Thr	acg Thr 140	aac Asn	cgt Arg	gtt Val	gcc Ala	tat Tyr 145	tct Ser	cca Pro	gca Ala	tct Ser	546
gta Val 150	act Thr	acg Thr	tcg Ser	gca Ala	act Thr 155	ccc Pro	gca Ala	atc Ile	act Thr	aca Thr 160	gta Val	act Thr	aca Thr	gga Gly	gcc Ala 165	594
Ser	Āla	Leu	Gln	Pro	aca Thr Thr	Āsp	Ser	Lau	Thr	Val	Glu	Asn	Ile	Ser	Gln	642
Ser	Ile	Lys	Phe	Phe	GJA GJA āāā	Asn	Leu	Ala	Asn	Phe	Gly	Ser	Ala	Ile	Ser	690

135/165

Fig. 25	(con't)							
Ser Ser Ser Ser	Pro The Pro The 200	ir Ala Va ir Ala Va	1 Val Ly 1 Val Ly 20	s Phe s Phe 5	Ile Asn Ile Asn	aac acc go Asn Thr Al Asn Thr Al 210	a Thr Met a Thr Met	738
Ser Fue	Ser mi	s Asn Pn	e ini se	r ser	GIV GIV	ggc gtg at Gly Val Il Gly Val Il 225		786
Gly Ser 230	Ser Let	Leu Phe Leu Phe 235	e Glu Asi	n Asn n Asn :	Ser Gly Ser Gly 240	tgc atc atc Cys Ile Ile Cys Ile Ile	Phe Thr Phe Thr 245	834
Ala Asn	Ser Cys	Val Asr Val Asr 250	ser Leu Ser Leu	Lys (Gly Val Gly Val 255	acc cct tca Thr Pro Ser Thr Pro Ser	Ser Gly Ser Gly 260	882
TITE TAT	wra ren	Gly Ser	GIV GIV	' Ala 1	Tie Cue	atc cct acg Ile Pro Thr Ile Pro Thr 275	C1 (T)	930
Phe Glu	Ten TAR	ASD ASD	Gin Giv	Lvs C	"ህፍ ጥሎት ፤	tto tot tat Phe Ser Tyr Phe Ser Tyr 290	3 03	978
THE PLO .	ASD ASD	ALA GIV	Ala Ile	TVT A	la Glu T la Glu T	acc tgc aac Thr Cys Asn Thr Cys Asn 805	T1 - 17-1	1025
Gry Mail	GTU GTA	Ara Leu	Leu Leu	Asp S	er Asn T	ct gca gcg hr Ala Ala hr Ala Ala	A B	1074
GTA GTA 5	na iii	CVS A_A	LVS Val	Leu As	sn Tla C	aa gga cgc ln Gly Arg ln Gly Arg	C1 D	1122
	ine ser	ALU ASII	Arg Ala	[-111 [.1	15 G) 11 G	ga gct att ly Ala Ile ly Ala Ile 355	71 - T1	1170
Gly Pro S	er var	GIV ASD	Pro Ala	LVS G1	ከ ጥኮታ ፍል	er Thr Leu :	Th T1 -	1213
	e÷ GTU	Gly Asp	TTS 4:4	PAR GI	ጠ ርገ፣ አለ	ac atg ctc asn Met Leu Asn Met Leu A		1266

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

Fig. 25 (con't)

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' '9'	20	,00	•)													
Lys	Pro	Gly	/ Il	e Arc	Ası	n Ala n Ala	a Ile	€ Th:	r Va.	l Gl	u Al u Al	a Gly	v G1	v Gl	g att u Ile u Ile 405	1314
Val	Ser	Let	ı Sei	r Ala	a Glr a Glr	ı Gly	/ Gly	/ Se:	Arc	g Le	u Va.	l Phe	Tv:	r Ās	t ccc p Pro p Pro	1362
TTE	Thr	His	Ser	Leu Leu	l Pro	Thr	Thr	· Ser	Pro	Se	r Asi	n Lus	: A = 7	o Il	t aca e Thr e Thr	1410
Ile	Asn Asn	Ala Ala 440	Asn Asn	Gly	Ala Ala	Ser Ser	Gly Gly 445	Ser Ser	Val	. Val . Val	l Ph∈ L Ph∈	Thr Thr 450	Ser Ser	Lys Lys	gga Gly Gly	1458
Leu	Ser 455	Ser	Thr	Glu	Leu Leu	Leu Leu 460	Leu Leu	Pro	Ala Ala	Asn Asn	Thr Thr 465	Thr	Thr	Ile Ile	ctt Leu Leu	1506
Leu 470	Gly	Thr	Val Val	Lys	11e 11e 475	Ala	Ser	Gly Gly	Glu Glu	Leu Leu 480	Lys Lys	Ile	Thr	qzA qzA	Asn Asn 485	1554
Ala	Val Val	Val Val	Asn Asn	Val Val 490	Ala	GJA	Phe Phe	Ala Ala	Thr Thr 495	Gln Gln	Gly Gly	tca Ser Ser	Gly Gly	Gln Gln 500	Leu Leu	1602
Thr	Leu	Gly	Ser 505	Gly	GIA	Thr	Leu Leu	Gly Gly 510	Leu Leu	Ala Ala	Thr	CCC Pro Pro	Thr Thr 515	Gly Gly	Ala Ala	1650
Pro	Ala	Ala 520	Val	Asp Asp	Phe Phe	Thr	Ile Ile 525	Gly	Lys Lys	Leu Leu	Ala Ala	ttc Phe Phe 530	Asp Asp	Pro	Phe Phe	1698
	Phe 535	Leu	Lys	Arg Arg	Asp Asp	Phe Phe 540	Val Val	Ser Ser	Ala Ala	Ser Ser	Val Val 545	Asn Asn	Ala Ala	Gly Gly	Thr Thr	1746
aaa a Lys 1 Lys 1 550	Asn	vai Vai	Thr	Leu Leu	Thr Thr 555	Gly .	Ala : Ala :	Leu Leu	Val Val	Leu Leu 560	Asp Asp	Glu I	His His	qzA qzA	Val Val 565	1794
aca o Thr A	າລຸບ	Leu	IYI	ASD .	met	va± :	Ser 1	Leu Leu	Gin	Ser	P∽o	Val 1	Ala Ala	T 1 a	D	1842

137/165

Title: CHLAMYDIA ANTIGENS AND SOURCE OF 1830446 CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig.	25	(con't)
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_	•															
Ile	Āla	Val	Phe	Lys	Gly	gca Ala Ala	Thr	Val	Thr	Lys	Thr	Gly	Phe	Pro	Asp	1890
Glv	Glu	Ile	Ala	Thr	Pro	agc Ser Ser	His	Tyr	Gly	Tyr	Gln	Gly	Lys	Trp	Ser	1938
Tyr	Thr	Tro	Ser	Arg	Pro	ctg Leu Leu 620	Leu	Ile	Pro	Ala	Pro	Asp	Gly	Gly	Phe	1986
Pro	Ğĺv	Ğĺv	Pro	Ser	Pro	agc Ser Ser	Ala	Asn	Thr	Leu	Tyr	Ala	Val	Trp	Asn	2034
Ser	Asp	Thr	Leu	Val	Arg	tct Ser Ser	Thr	Tyr	Ile	Leu	Asp	Pro	Glu	Arg	Tyr	2082
Ğĺv	Ğlu	Ile	Val	Ser	Asn	agc Ser Ser	Leu	GIT	Ile	Ser	Phe	Leu	Gly	Asn	Gln	2130
Āla	Phe	Ser	Asp	Ile	Leu	caa Gln Gln	Asp	Val	Leu	Leu	Ile	Asp	His	Pro	Gly	2178
Leu	Ser	Ile	Thr	Ala	Lys	gct Ala Ala 700	Leu	Gly	Ala	Tyr	Val	Glu	His	Thr	P≍o	2226
Ara	Gln	Glv	His	Glu	Gly	ttt Phe Phe	Ser	Gly	Arg	Tyr	Gly	Gly	Tyr	Gln	Ala	2274
Ala	Leu	Ser	Met	Asn	Tyr	acg Thr Thr	Asp	His	Thr	Thr	Leu	Gly	Leu	Ser	Phe	2322
Gly	Gln	Leu	Tyr	Gly	Lys	act Thr Thr	Asn	Ala	Asn	Pro	Tyr	Asp	Ser	Arg	Cys	2370
Ser	Glu	Gln	Met	Tyr	Leu	ctc Leu Leu	Ser	Phe	Phe	Gly	Gln	Phe	Pro	Ile	Val	2418

Title: CHLAMYDIA ANTIGENS AND 30 0 9 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al

WO 00/24765

DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig	g. 25	(con	i't)													
The	: Glr	ı Lys ı Lys	s Ser	: Glu	ı Ala	Let	ı Ile	: Se:	: Tru	Lv:	s Al	a Ala a Ala	TV	- Gī,	t tat y Tyr y Tyr	2466
Ser	Lys Lys	Asn	ı His	Leu	Asn	Thr Thr	Thr	Tvr	Leu	ı Ard	g Pro	A SD	Lvs	Δ1 =	cca Pro Pro 805	2514
Lys	Ser	Gln	Gly	Gln	Trp	His	Asn	Asn	Ser	Tyr Tyr	יטיד -	gtt Val Val	T.e.11	Tla	Ser Ser	2562
Ala	Glu	His	Pro	Phe	Leu	Asn	Trp	Cvs	Leu	Leu	Thr	aga : Arg : Arg	Pro	Leu Leu	gct Ala Ala	2610
GID	Ala	Trp	Asp	Leu	Ser	Gly	Phe	Ile	Ser	Ala	G111	ttc Phe Phe 850	Len	Giv	ggt Gly Gly	2658
Trp	Gin 855	Ser	Lys	Phe	Thr	Glu 860	Thr	Gly Gly	Asp	Leu Leu	Gln Gln 865	cgt Arg Arg	Ser Ser	Phe Phe	Ser Ser	2706
Arg 870	Gly	Lys	GIA	Tyr	Asn Asn 875	Val Val	Ser	Leu Leu	Pro	Ile Ile 880	Gly	tgt Cys Cys	Ser Ser	Ser Ser	Gln Gln 885	2754
Trp	Phe	Thr	Pro	Phe	Lys	Lys	Ala	Pro	Ser	Thr	Leu	acc Thr Thr	Tie	Luc	Tan	2802
мта	Tyr	Lys	Pro	Asp	Ile	Tvr	Arg Arg	Val	Asn	P∽o	His	aat Asn Asn	710	17-17	ጥኤ –	2850
val	Vai Val	Ser	Asn	Gln	Glu	Ser	Thr	Ser	Ile	Ser	Glv	gca Ala Ala 930	Ben	Lau	7 ~~	2398
Arg	nis	GLY	Leu	Phe	Val Val	Gln	Ile :	His .	Asp '	Val Val	Val	gat (Asp 1 Asp 1	- 11 ·	アレー	C1.,	2946

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 25 (con't)												
gac act cag gcc ttt cta aac tat acc ttt gac ggg aaa aat gga ttt Asp Thr Gln Ala Phe Leu Asn Tyr Thr Phe Asp Gly Lys Asn Gly Phe Asp Thr Gln Ala Phe Leu Asn Tyr Thr Phe Asp Gly Lys Asn Gly Phe 950 965	2994											
aca aac cac cga gtg tct aca gga cta aaa tcc aca ttt taaaactcta Thr Asn His Arg Val Ser Thr Gly Leu Lys Ser Thr Phe Thr Asn His Arg Val Ser Thr Gly Leu Lys Ser Thr Phe 970	3043											
agetetgett agagttttet grageseegg tegtettaga atectetate cateategaa	3103											
gaacttagca atgaaggeea agatteteae tetatgagaa eeceece	3150											

Ballian in

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 26 (RY-47)

WO 00/24765

Restriction enzyme analysis of CPN100630

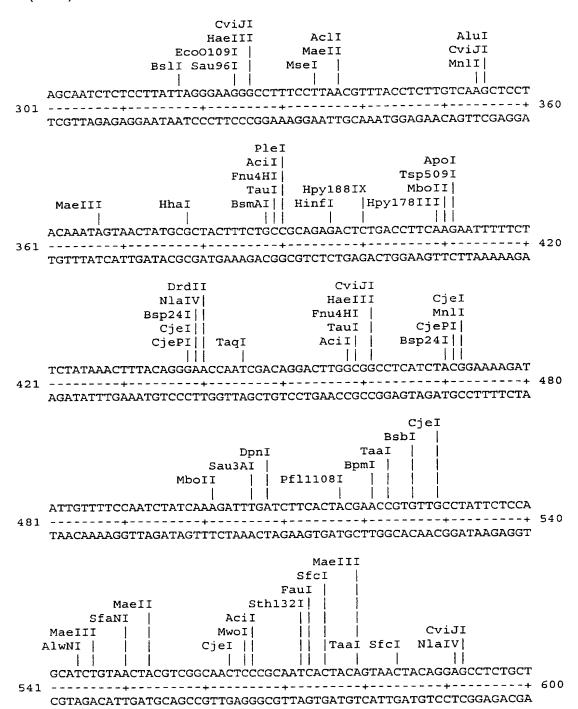
	Hpy178III MnlI TspRI Sth132I BfaI	
	Taal Foki BscGi Xbai Tsp509i	
1	GTGACACCTACACTATAAGCGTCTTGGAGGGCAGTTTATATGAGATCTATATCCTTCGTT	60
	NlaIII NspI DraI SphI MnlI MseI MnlI Cac8I MboII ATTACGATTTTAAACCTTATTTAACGACAGGGTTGAGGCATGCCTCTTTCTT	
61	TAATGCTAAAATTTGGAATAAATTGCTGTCCCAACTCCGTACGGAGAAAGAA	120
	BsmAI HinfI HhaI MnlI ThaI BfaI BsmAI BfaI BsaI BseMII PleI	
121	AGTAGAAAAACAGATGAACGGACAAATACATCACGTTCAACGCGCAAACGACTCTGATCT	180
	Hpy188IX Tth111II MboII HphI DpnI BglII HinfI Sau3AI	
ipy18	38IX Tsp509I MnlI EarI	
181	GAGCCTCCCTTGAAACAAGGAGGTTAATGCTTAGTCCCACTTCTCTAGAATGAGTGAAGT	240
241	GATTTTGTTCAAACTTCTTGGGGGGGGGGTTTTTCAAGTTCCTTTATCAATAGTTCC+ CTAAAACAAACAAGTTTGAAGAACCCCCGCTCAAAAAGTTCAAGGAAATAGTTATCAAGG	300

AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 26 (con't)



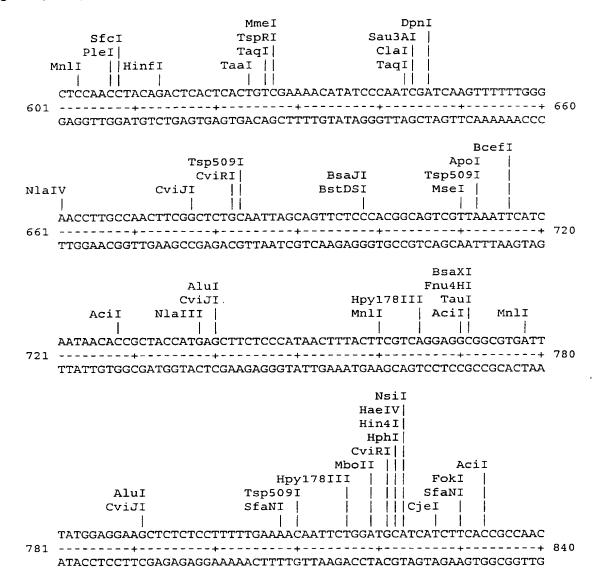
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

09/830446

PCT/CA99/00992

Fig. 26 (con't)



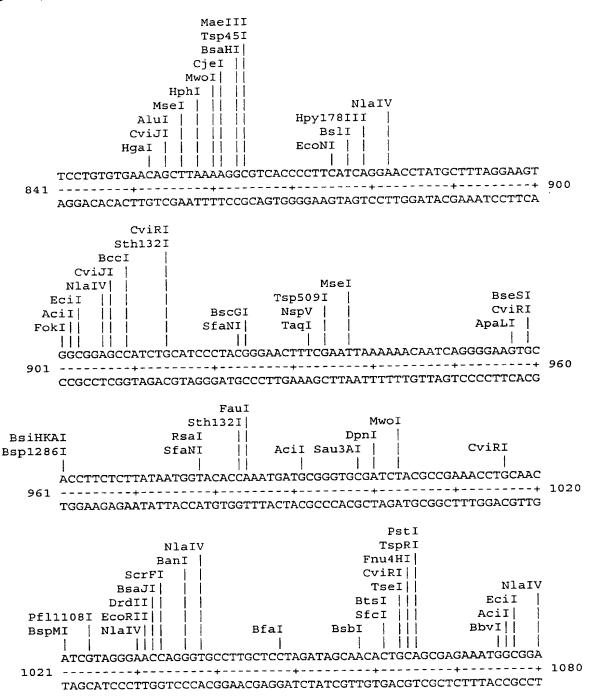
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AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Fig. 26 (con't)



Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 097830446

PCT/CA99/00992

Fig. 26 (con't)

					AvaI		Hpy178II	I	
					Sau96	_	οI	1	
			Ssj	pΙ	AciI			1	
F	BccI	B	siHKAI		ThaI	Tsp50	9I BfaI		
Cvid	JI Mw	oI Bs	p1286I	Ttl	hlllI	HgaI	XbaI	Acil	
			1	1			1 11	1	
	GCCAT	CTGTGCTAA							
1081	` -	·					•	+	1140
	CGGTA	GACACGATT'	TCACGAGT'	TATAAGTT	CCTGCG	CCAGGATA	ACTTAAGAG	ATCTTTG	
				377	- T17				
				Cvi	aIV				
	AciI		MmoT		•	BslI			
	HhaI		MmeI AluI		T .	aI Mnl:	τ		
ጥኒ	ThaI naI		CviJI			AI Sim			
11	1 1	•	1	Sau yo.		1 1 51	l		
	CGCGC	GGAGAAGGG'	ו ו דקקאקרידאי	ττττατα	1	ııı PCTGTTGG	I AGACCCTGC	SAAGCAA	
1141									1200
		CCTCTTCCC							
						BsaJ:	I Nla	aIII	
			Hpy1	B8IX		Sty:	I 1	NspI	
	TaqI	Tth111II	CviJI	1		HphI	Cje:	r	
		į				Ì	1		
		GACACTTAC							
1201									1260
	TGTAG	CTGTGAATG	CTAAAACC	GAAGGCTT	CACTA	raacgcaa(GGTTCCTTT	JTACGAG	
		HinfI					Hin4	11	
		TfiI		CjeI			Hin4I	1	
	×4	ScrFI		BccI Ta			BsaXI	-	
	EC	ORII	AciI 1	BsrDI Sfo	37		BsgI	ŀ	
) }			777007000	1		
1061		AAAACCTGG							1320
1261		TTTTGGACC		·		•			1320
	TIAIG	TTTTGGACC	TIAGGCGI.	IACGGIAG.	IGACAI	LIICGICC	CCICICIA	ICACAGA	
					Dpr	٦T			
	Cvi	RT	MaeII	5	Sau3AI		CviJI		
Bsn	nAI Mn		iJI	Alw		İ	BsaXI		
		1	Īi		l İ	i	1 i		
	CTATC	TGCACAAGG	AGGCTCAC	GTCTTGTA	TTTTATO	GATCCCAT?	racacatag	CCTCCCA	
1321		+				+		+	1380
	GATAG	ACGTGTTCC'	TCCGAGTG	CAGAACATA	AAAATA	CTAGGGTA	ATGTGTATC	GAGGGT	

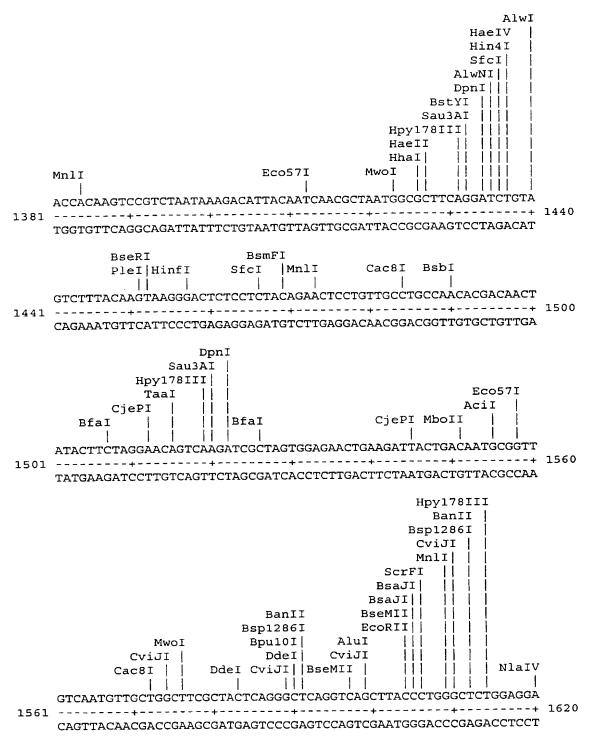
CORRESPONDING DNA FRAGMENTS AND USES THEREOF

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 26 (con't)



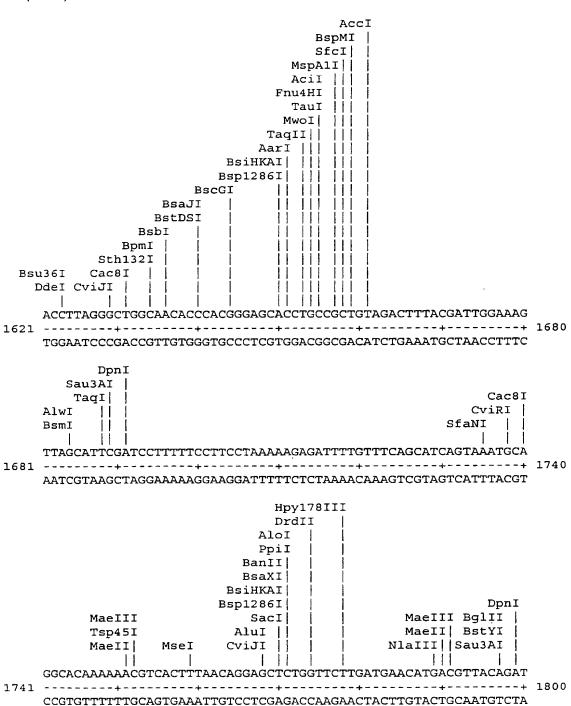
Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS

AND USES THEREOF
Inventor(s): Andrew D. MURDIN et al
DOCKET NO.: 032931/0251

PCT/CA99/00992

WO 00/24765

Fig. 26 (con't)

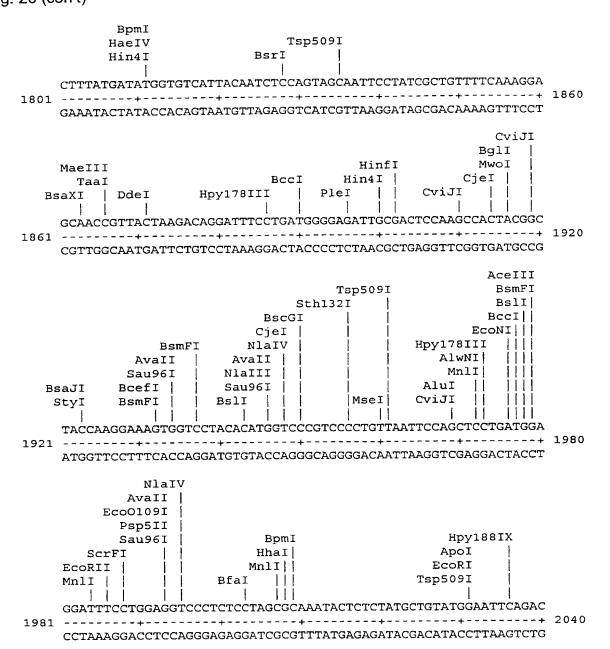


Title: CHLAMYDIA ANTIGENS AND 1111 097830446 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 26 (con't)



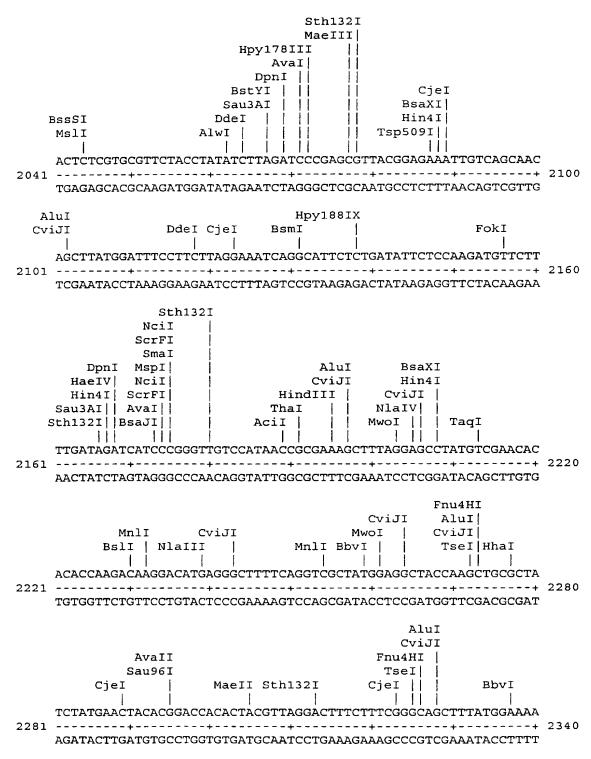
AND USES THEREOF

WO 00/24765

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 26 (con't)

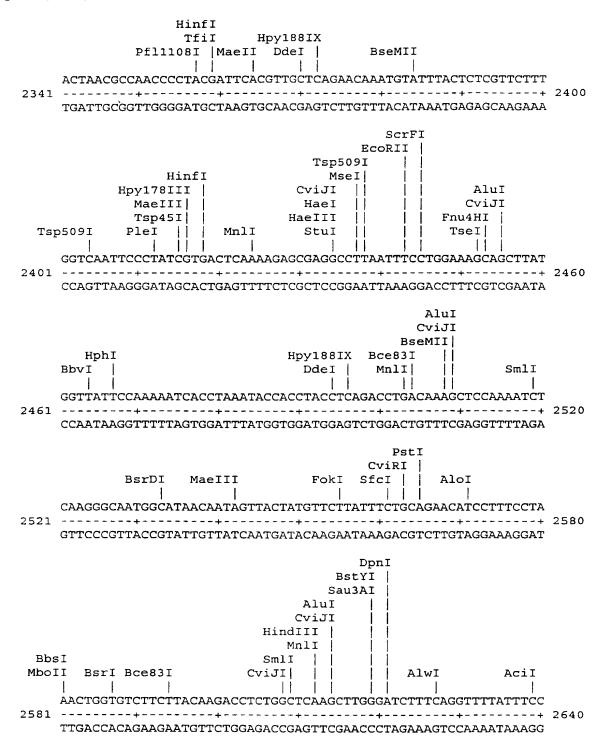


Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 09/830446

PCT/CA99/00992

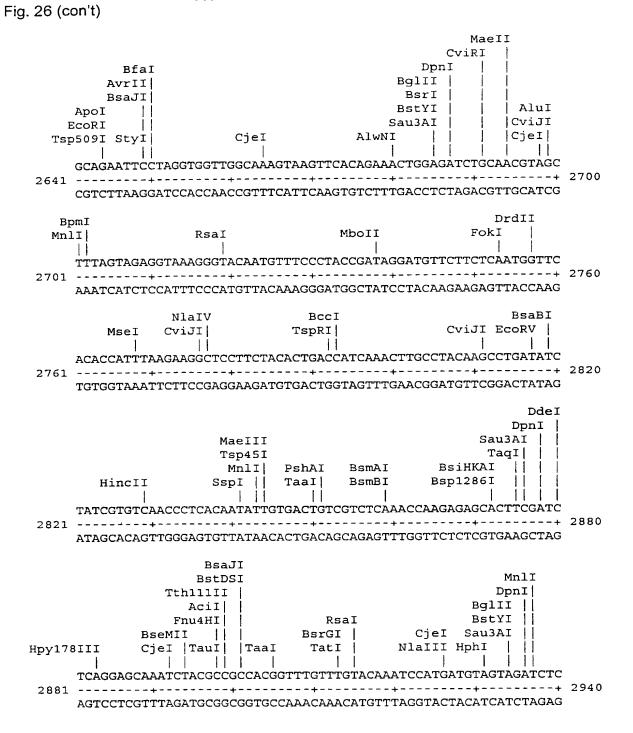
Fig. 26 (con't)



Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

09/830446

PCT/CA99/00992

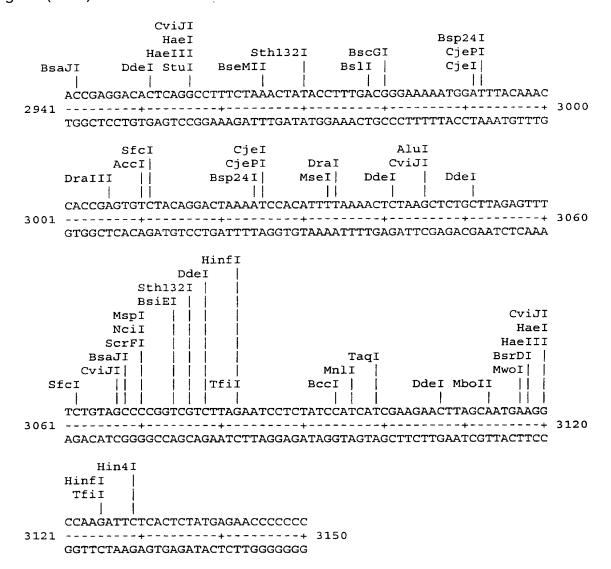


Title: CHLAMYDIA ANTIGENS AND STILLING 1850466 CORRESPONDING DNA FRAGMENTS

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Fig. 26 (con't)



AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

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Figure 27: CPN100397

1 MKIPLRFLLI SLVPTLSMSN LLGAATTEEL SASNSFDGTT STTSFSSKTS 51 SATDGTNYVF KDSVVIENVP KTGETQSTSC FKNDAAAGDL NFLGGGFSFT 101 FSNIDATTAS GAAIGSEAAN KTVTLSGFSA LSFLKSPAST VTNGLGAINV 151 KGNLSLLDND KVLIQDNFST GDGGAINCAG SLKIANNKSL SFIGNSSSTR 201 GGAIHTKNLT LSSGGETLFQ GNTAPTAAGK GGAIAIADSG TLSISGDSGD 251 IIFEGNTIGA TGTVSHSAID LGTSAKITAL RAAQGHTIYF YDPITVTGST 301 SVADALNINS PDTGDNKEYT GTIVFSGEKL TEAEAKDEKN RTSKLLQNVA 351 FKNGTVVLKG DVVLSANGFS QDANSKLIMD LGTSLVANTE SIELTNLEIN 401 IDSLRNGKKI KLSAATAQKD IRIDRPVVLA ISDESFYQNG FLNEDHSYDG 451 ILELDAGKDI VISADSRSID AVQSPYGYQG KWTINWSTDD KKATVSWAKQ 501 SFNPTAEQEA PLVPNLLWGS FIDVRSFQNF IELGTEGAPY EKRFWVAGIS 551 NVLHRSGREN QRKFRHVSGG AVVGASTRMP GGDTLSLGFA QLFARDKDYF 601 MNTNFAKTYA GSLRLQHDAS LYSVVSILLG EGGLREILLP YVSKTLPCSF 651 YGQLSYGHTD HRMKTESLPP PPPTLSTDHT SWGGYVWAGE LGTRVAVENT 701 SGRGFFQEYT PFVKVQAVYA RQDSFVELGA ISRDFSDSHL YNLAIPLGIK 751 LEKRFAEQYY HVVAMYSPDV CRSNPKCTTT LLSNQGSWKT KGSNLARQAG 801 IVQASGFRSL GAAAELFGNF GFEWRGSSRS YNVDAGSKIK F

Possible T cell epitope:

516 LLWGSFIDV

Possible B cell epitope:

554 HRSGRENQRKFRHV

Title: CHLAMYDIA ANTIGENS AND LEAD CORRESPONDING DNA FRAGMENTS
AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 28: CPN100421

1	MPPLNADDVL	PRDHLSDGSF	SDTYPDITTQ	AIILIFLALS	PFLVMLLTSY
51	LKIIITLVLL	RNALGVQQTP	PSQVLNGIAL	ILSIYVMFPT	GVAMYKDARK
101	EIEANTIPOS	LFTAEGAETV	FVALNKSKEP	LRSFLIRNTP	KAQIQSFYKI
151	SOKTFPSEIR	AHLTASDFVI	IIPAFIMGQI	KNAFEIGVLI	YLPFFVIDLV
				DGWTLLLQGL	

Possible T cell epitope:

188 VLIYLPFFV

Possible B cell epitope:

125 NKSKEPLR

Title: CHLAMYDIA ANTIGENS AND S THE LAND

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

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Figure 29: CPN100422

1 MKFFSLIFKD DDVSPNKKVL SPEAFSAFLD AKELLEKTKA DSEAYVAETE 51 QKCAQIRQEA KDQGFKEGSE SWSKQIAFLE EETKNLRIRV REALVPLAIA

101 SVRKIIGKEL ELHPETIVSI ISQALKELTQ NKHIIISVNP KDLPLVEKSR

151 PELKNIVEYA DSLILTAKPD VTPGGCIIET EAGIINAQLD VQLDALEKAF 201 STILKAKNPV DEPSETSSST DSSSLSNDQD KKE

Possible T cell epitope:

163 LILTAKPDV

Possible B cell epitope:

226 SNDQDKKE

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS 097830446

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

ventor(s): Andrew D. MURDIN et a DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 30: CPN100424

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1 MTLLCCTSCN SRSLIVHGLP GREANEIVVL LVSKGVAAQK LPQAAAATAG
51 AATEQMWDIA VPSAQITEAL AILNQAGLPR MKGTSLLDLF AKQGLVPSEL
101 QEKIRYQEGL SEQMASTIRK MDGVVDASVQ ISFTTENEDN LPLTASVYIK
151 HRGVLDNPNS IMVSKIKRLI ASAVPGLVPE NVSVVSDRAA YSDITINGPW
201 GLTEEIDYVS VWGIILAKSS LTKFRLIFYV LILLLFVISC GLLWVIWKTH
251 TLIMTMGGTK GFFNPTPYTK NALEAKKAEG AAADKEKKED ADSQGESKNA
301 ETSDKDSSDK DAPEGSNEIE GA

Possible T cell epitope:

201 GLTEEIDYV

Possible B cell epitope:

284 DKEKKEDADSQGESKNAETSDKDSSDKDAPEGSNEIE

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Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al

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DOCKET NO.: 032931/0251

Figure 31: CPN100426

1 MTIRVRNLAY SVNKKKILDG VTFSLERGHI TLFVGKSGSG KTMILRALAG 51 LVQPTQGDIW IEGEAPALVF QQPELFSHMT VLGNCTHPQI HIKGRSTEEA 101 REKAFELLHL LDIEEVAKNY PDQLSGGQKQ RVAIVRSLCM DKHTLLFDEP 151 TSALDPFATA SFRHLLETLR DQCTTT HDMQFVHSCL DRIYLIDQGT

201 VAGVYDKRDG ELDSGHPLSK YIHSAQ

Possible T cell epitope:

145 LLFDEPTSA

Possible B cell epitope:

205 YDKRDGE

Title: CHLAMYDIA ANTIGENS AND

CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

PCT/CA99/00992

Figure 32: CPN100508

WO 00/24765

1	MKRPFFTYLC	IIFYGSCASL	SLHAGLSFPE	VRGATAAVVH	ADSGKVFYDK
		MTKIATALFI			
					AANVLAMACC
		NFFLKEEIGC			
					YHYPPALGGK
251	TGTTKTAGKN	LIMAAEKNNR	LLVTIATGYS	GPVSDLYQDV	IALCETVFNE
301	PLLRKELVPP	SDCLQLEIAN	LGKLSCPLPE	GLYYDFYASE	DREPLSVSFI
351	AHADAFPIEQ	GDLLGHWVFY	DDEGKKISSQ	PFYAPCRFER	TIKPWKLYMK
401	RVFTSYRTYM	SITMLLMYFR	IRKHRKYKNL	KHYSKI	

Possible T cell epitope:

156 FMDKLNFFL

Possible B cell epitope:

422 RKHRKYKN WO 00/24765

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

09/830446

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Figure 33: CPN100515.

1	MASNPILQIE	DLSITLAKQR	QQYPIVQSLS	FTINEGQTLA	IIGESGSGKS
51			VNFQGHNLLT		GTEISMIFQN
101	PQASLNPVFT	IEQQFREIIH	THLALTAEVA	KEKMLYALEE	TĢFHDPRLCL
151	NLYPHQLSGG	MLQRICIAMA	LLCSPKLLIA	DEPTTALDVS	VQYQILQLLK
201	TLQKKTGMSL	LIITHNMGVV	AETADDVLVL	YAGRMVECAP	AVQMFHNPSH
251	PYTRDLLASR	PSLQPQQLGS	FNPIPGQPPH	YTAFPSGCRY	HPRCSKILNR
301	CSAEAPEIYP	VREGHKVRVG	CMTTNFPQPL	IQATSLTKHY	YKRSFWFQGK
351	TIASRPVDDV	SFSLYSRRAV	GLIGESGSGK	STLALALAGL	LPLTSGFLTF
401	NGTPIKLHSK	HGRHQLRSQV	RLVFQNPQAS	LNPRKTILDS	LGHSLLYHKL
451	VPKEKVLATV	REYLELVGLS	EEYFYRYPHQ	LSGGQQQRVS	IARALLGVPQ
501	LIICDEIVSA	LDLSIQAQIL	NMLAELQKKL	SLTYLFISHD	LAVVRSFCTE
551	VFIMYKGQIV	EKGNTKRIFS	DPQHPYTRML	LNAQLPETPD	QRQSKPIFQE
601	YHKDSEESCS	TGCYFYNRCP	QKQEACKSEI	IPNQGDAHHT	YRCIH

Possible T cell epitope:

59 LLPCPPFSV

Possible B cell epitopes:

18 KQRQQY

587 ETPDQRQSK

077830448

Tide: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 34: CPN100538

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1 MPGIEKAATT VAVPQDKSEE EKVKERLTKR ELTCEDLKDN GYTVNFEDIS
51 ILELLQFVSK ISGTNFVFDS NDLQFNVTIV SHDPTSVDDL STILLQVLKM
101 HDLKVVEQGN NVLIYRNPHL SKLSTVVTDS SLKETCEAVV VTRVFRLYRR
151 QPSAAVNIIQ PLLSHDAIVS ASEATRHVII SDIAGNVDKV SDLLAALDCP
201 GTSVDMTEYE VKYANPAALV SYCQDVLGTL AEDDAFQMFI QPGTNKIFVV
251 SSPRLANKAE QLLKSLDVPE MAHTLDDPAS TALALGGTGT TSPKSLRFFM
301 YKLKYQNGEV IANALQDIGY NLYVTTAMDE DFINTLNSIQ WLEVNNSIVI
351 IGNQGNVDRV IGLLNGLDLP PKQVYIEVLI LDTSLEKSWD FGVQWVALGD
401 EQSKVAYASG LLNNTGIATP TKATVPPGTP NPGSIPLPTP GQLTGFSDML
451 NSSSAFGLGI IGNVLSHKGK SFLTLGGLLS ALDQDGDTVI VLNPRIMAQD
501 TQQASFFVGQ TVPYQTIKYY IQETGTVTQN IDYEDIGVNL VVTSTVAPNN
551 VVTLQIEQTI SELHSASGSL TPVTDKTYAA TRLQIPDGCF LVMSGHIRDK
601 TTKVVSGVPL LNSIPLIRGL FSRTIDQRQK RNIMMFIKPK VISSFEEGTR
651 VTNKEGYRYN WEADEGSMQV APRHAPECQG PPSLQAESDF KIIEIEAQ

Possible T cell epitope:

50 SILELLQFV

Possible B cell epitopes:

15 QDKSEEEK 626 DQRQKRN

Title: CHLAMYDIA ANTIGENS AND A GRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 35: CPN100557

1 MSRKDNEVSL ARSIFNILSG TFCSRITGIF REIAMATYFG ADPIVAAFWL 51 GFRTVFFLRK ILGGLILEQA FIPHFEFLRA QSLDRAAFFF RRFSRLIKGS 101 TIIFTLLIEA VLWVFFNNVE EGTYDMILLT MILLPCGIFL MMYNVNGALL 151 HCGNKFFGVG LAPVVVNIIW IFFVIAARHS DPRERIIGLS VALVIGFFFE 201 WLITVPGVWK FLLEAKSPPQ EHDSVRALLA PLSLGILTSS IFQLNLLSDI 251 CLARYVHEIG PLYLMYSLKI YQLPIHLFGF GVFTVLLPAI SRCVQREDHE 301 RGLKLMKFVL TLTMSVMIIM TAGLLLLALP GVRVLYEHGL FPQSAVYAIV 351 RVLRGYGASI IPMALAPLVS VLFYAQRQYA VPLFIGIGTA LANIVLSLVL 401 GRWVLKDVSG ISYATSITAW VQLYFLWYYS SKRLPMYSKL LWESIRRSIK 451 VMGTTMLACM ITLGLNILTQ TTYVIFLNPL TPLAWPLSSI TAQAIAFLSE 501 SCIFLAFLFG FAKLLRVEDL INLASFEYWR GQRGLLQRQH VMQDTQN

Possible T cell epitope:

111 VLWVFFNNV

Possible B cell epitopes:

1 MSRKDNE 295 QREDHERG

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS 59/830446 CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 36: CPN100622

1	MKTSRNKOCK	ITDPLSKSSF	FVGALILGKT	TILLNATPLS	DYFDNQANQL
51	TTLFPLIDTL	TNMTPYSHRA	TLFGVRDDTN	QDIVLDHQNS	IESWFENFSQ
101	DGGALSCKSL	AITNTKNQIL	FLNSFAIKRA	GAMYVDGNFD	LSENHGSIIF
151	SGNLSFPNAS	NFADTCTGGA	VLCSKNVTIS	KNQGTAYFIN	NKAKSSGGAI
201	OAAIINIKDN	TGPCLFFNNA	AGGTAGGALF	ANACRIENNS	QPIYFLNNQS
251	GLGGAIRVHO	ECILTKNTGS	VIFNNNFAME	ADISANHSSG	GAIYCISCSI
301	KDNPGIAAFD	NNTAARDGGA	ICTQSLTIQD	SGPVYFTNNQ	GTWGGAIMLR
351	ODGACTLFAD	OGDIIFYNNR	HFKDTFSNHV	SVNCTRNVSL	TVGASQGHSA
401	TFYDPILORY	TIQNSIQKFN	PNPEHLGTIL	FSSTYIPDTS	TSRDDFISHF
451	RNHIGLYNGT	LALEDRAEWK	VYKFDQFGGT	LRLGSRAVFS	TTDEEQSSSS
501	VGSVININNL	AINLPSILGN	RVAPKLWIRP	TGSSAPYSED	NNPIINLSGP
551	LSLLDDENLD	PYDTADLAQP	IAEVPLLYLL	DVTAKHINTD	NFYPEGLNTT
601	OHYGYOGVWS	PYWIETITTS	DTSSEDTVNT	LHRQLYGDWT	PTGYKVNPEN
651	KGDIALSAFW	QSFHNLFATL	RYQTQQGQIA	PTASGEATRL	FVHQNSNNDA
701	KGFHMEATGY	SLGTTSNTAS	NHSFGVNFSQ	LFSNLYESHS	DNSVASHTTT
751	VALQINNPWL	QERFSTSASL	AYSYSNHHIK	ASGYSGKIQT	EGKCYSTTLG
801	AALSCSLSLQ	WRSRPLHFTP	FIQAIAVRSN	QTAFQESGDK	ARKFSVHKPL
851	YNLTVPLGIQ	SAWESKFRLP	TYWNIELAYQ	PVLYQQNPEI	NVSLESSGSS
901	WLLSGTTLAR	NAIAFKGRNQ	IFIFPKLSVF	LDYQGSVSSS	TTTHYLHAGT
951	TFKF				

Possible T cell epitope:

119 ILFLNSFAI

Possible B cell epitopes:

KTSRNKQ 647 NPENKG QNSNNDAK 694

Title: CHLAMYDIA ANTIGENS AND 11 6 09 68 30 446

CORRESPONDING DNA FRAGMENTS AND USES THEREOF Inventor(s): Andrew D. MURDIN et al.

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 37: CPN100626

1	MQVFPKVTLS	LDYSADISSS	TLSHYLNVAS	RMRFLTISDQ	NRKIKEPLVS
51	KTPPKFLFYL	GNFTACMFGM	TPAVYSLQTD	SLEKFALERD	EEFRTSFPLL
101	DSLSTLTGFS	PITTFVGNRH	NSSQDIVLSN	YKSIDNILLL	WTSAGGAVSC
151	NNFLLSNVED	HAFFSKNLAI	GTGGAIACQG	ACTITKNRGP	LIFFSNRGLN
201	NASTGGETRG	GAIACNGDFT	ISQNQGTFYF	VNNSVNNWGG	ALSTNGHCRI
251	QSNRAPLLFF	NNTAPSGGGA	LRSENTTISD	NTRPIYFKNN	CGNNGGAIQT
301	SVTVAIKNNS	GSVIFNNNTA	LSGSINSGNG	SGGAIYTTNL	SIDDNPGTIL
351	FNNNYCIRDG	GAICTQFLTI	KNSGHVYFTN	NQGNWGGALM	LLQDSTCLLF
401	AEQGNIAFQN	NEVFLTTFGR	YNAIHCTPNS	NLQLGANKGY	TTAFFDPIEH
451	QHPTTNPLIF	NPNANHQGTI	LFSSAYIPEA	SDYENNFISS	SKNTSELRNG
501	VLSIEDRAGW	QFYKFTQKGG	ILKLGHAASI	ATTANSETPS	TSVGSQVIIN
551	NLAINLPSIL	AKGKAPTLWI	RPLQSSAPFT	EDNNPTITLS	GPLTLLNEEN
601	RDPYDSIDLS	EPLQNIHLLS	LSDVTARHIN	TDNFHPESLN	ATEHYGYQGI
651	WSPYWVETIT	TTNNASIETA	NTLYRALYAN	WTPLGYKVNP	EYQGDLATTP
701	LWQSFHTMFS	LLRSYNRTGD	SDIERPFLEI	QGIADGLFVH	QNSIPGAPGF
751	RIQSTGYSLQ	ASSETSLHQK	ISLGFAQFFT	RTKEIGSSNN	VSAHNTVSSL
801	YVELPWFQEA	FATSHSLAYG	YGDHHLHAYI	RHIKNRAEGT	CYSHTLAAAI
851	GCSFPWQQKS	YLHLSPFVQA	IAIRSHQTAF	EEIGDNPRKF	VSQKPFYNLT
901	LPLGIQGKWQ	SKFHVPTEWT	LELSYQPVLY	QQNPQIGVTL	LASGGSWDIL
951	GHNYVRNALG	YKVHNOTALF	RSLDLFLDYO	GSVSSSTSTH	HLOAGSTLKF

Possible T cell epitope:

56 FLFYLGNFT

Possible B cell epitopes:

39 DQNRKIK 597 NEENRDPYD

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS 05204

AND USES THEREOF Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251 09/830446 PCT/CA99/00992

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Figure 38: CPN100628

1 MLLPFTFVLA NEGLOLPLET YITLSPEYQA APQVGFTHNQ NQDLAIVGNH 51 NDFILDYKYY RSNGGALTCK NLLISENIGN VFFEKNVCPN SGGAIYAAQN 101 CTISKNONYA FTTNLVSDNP TATAGSLLGG ALFAINCSIT NNLGQGTFVD 151 NLALNKGGAL YTETNLSIKD NKGPIIIKQN RALNSDSLGG GIYSGNSLNI 201 EGNSGAIQIT SNSSGSGGGI FSTQTLTISS NKKLIEISEN SAFANNYGSN 251 FNPGGGGLTT TFCTILNNRE GVLFNNNQSQ SNGGAIHAKS IIIKENGPVY 301 FLNNTATRGG ALLNLSAGSG NGSFILSADN GDIIFNNNTA SKHALNPPYR 351 NAIHSTPNMN LQIGARPGYR VLFYDPIEHE LPSSFPILFN FETGHTGTVL 401 FSGEHVHQNF TDEMNFFSYL RNTSELRQGV LAVEDGAGLA CYKFFQRGGT 451 LLLGOGAVIT TAGTIPTPSS TPTTVGSTIT LNHIAIDLPS ILSFQAQAPK 501 IWIYPTKTGS TYTEDSNPTI TISGTLTLRN SNNEDPYDSL DLSHSLEKVP 551 LLYIVDVAAQ KINSSQLDLS TLNSGEHYGY QGIWSTYWVE TTTITNPTSL 601 LGANTKHKLL YANWSPLGYR PHPERRGEFI TNALWQSAYT ALAGLHSLSS 651 WDEEKGHAAS LQGIGLLVHQ KDKNGFKGFR SHMTGYSATT EATSSQSPNF 701 SLGFAQFFSK AKEHESQNST SSHHYFSGMC IAKYSLQRVI RLSVSLAYMF 751 TSEHTHTMYQ GLLEGNSQGS FHNHTLAGAL SCVFLPQPHG ESLQIYPFIT 801 ALAIRGNLAA FQESGDHARE FSLHRPLTDV SLPVGIRASW KNHHRVPLVW 851 LTEISYRSTL YRQDPELHSK LLISQGTWTT QATPVTYNAL GIKVKNTMQV 901 FPKVTLSLDY SADISSSTLS HYLNVASRMR F

Possible T cell epitope:

L MLLPFTFVL

Possible B cell epitopes:

38 HNQNQ

619 YRPHPERRG

669 HQKDKNG

Title: CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF

Inventor(s): Andrew D. MURDIN et al DOCKET NO.: 032931/0251

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Figure 39: CPN100630

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					,
1	MPLSFKSSSF	CLLACLCSAS	CAFAETRLGG	NFVPPITNQG	EEILLTSDFV
51	CSNFLGASFS	SSFINSSSNL	SLLGKGLSLT	FTSCQAPTNS	NYALLSAAET
101	LTFKNFSSIN	FTGNQSTGLG	GLIYGKDIVF	QSIKDLIFTT	NRVAYSPASV
151	TTSATPAITT	VTTGASALQP	TDSLTVENIS	QSIKFFGNLA	NFGSAISSSP
201	TAVVKFINNT	ATMSFSHNFT	SSGGGVIYGG	SSLLFENNSG	CIIFTANSCV
251	NSLKGVTPSS	GTYALGSGGA	ICIPTGTFEL	KNNQGKCTFS	YNGTPNDAGA
301	IYAETCNIVG	NOGALLLDSN	TAARNGGAIC	AKVLNIQGRG	PIEFSRNRAE
351	KGGAIFIGPS	VGDPAKOTST	LTILASEGDI	AFQGNMLNTK	PGIRNAITVE
401	AGGEIVSLSA	OGGSRLVFYD	PITHSLPTTS	PSNKDITINA	NGASGSVVFT
451	SKGLSSTELL	LPANTTTILL	GTVKIASGEL	KITDNAVVNV	AGFATQGSGQ
501	LTLGSGGTLG	LATPTGAPAA	VDFTIGKLAF	DPFSFLKRDF	VSASVNAGTK
551	NVTLTGALVL	DEHDVTDLYD	MVSLOSPVAI	PIAVFKGATV	TKTGFPDGEI
601	ATPSHYGYQG	KWSYTWSRPL	LIPAPDGGFP	GGPSPSANTL	YAVWNSDTLV
651	RSTYILDPER	YGEIVSNSLW	ISFLGNQAFS	DILQDVLLID	HPGLSITAKA
701	LGAYVEHTPR	OGHEGFSGRY	GGYQAALSMN	YTDHTTLGLS	FGOLYGKTNA
751	NPYDSRCSEQ	MYLLSFFGQF	PIVTOKSEAL	ISWKAAYGYS	KNHLNTTYLR
. – –	PDKAPKSQGQ	WHNNSYYVLI	SAEHPFLNWC	LLTRPLAOAW	DLSGFISAEF
801	LGGWQSKFTE	TGDLORSFSR	GKGYNVSLPI	GCSSOWFTPF	KKAPSTLTIK
851	LAYKPDIYRV	NPHNIVTVVS	NOESTSISGA	NLRRHGLFVQ	IHDVVDLTED
901	TOVELVALED	GKNGFTNHRV	STGLKSTF		

Possible T cell epitope:

936 GLFVQIHDV

Possible B cell epitopes:

281 KNNQGK 345 SRNRAEK 707 HTPRQGHE

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and

for which a patent is sought on the invention entitled:

CHLAMYDIA ANTIGENS AND CORRESPONDING DNA FRAGMENTS AND USES THEREOF the specification of which is attached hereto. was filed on April 27, 2001 as U.S. Application Serial No. 09/830,446 \boxtimes was filed on October 28, 1999 as PCT International Application No. PCT/CA99/00992

and (if applicable) was amended on

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information known to me which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §§1.56(a) and (b), which state:

February 8, 2001

- "(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:
 - (1) prior art cited in search reports of a foreign patent office in a counterpart application.
 - the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

- (b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and
 - It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or
 - (2) It refutes, or is inconsistent with, a position the applicant takes in:
 - (i) Opposing an argument of unpatentability relied on by the Office, or
 - (ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability."

I hereby claim foreign priority benefits under 35 United States Code, §119 and/or §365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing of this application:

PRIOR FOREIGN APPLICATION(S)

			Date First		
Number	Country	Filing Date (Day/Month/Year)	Laid-open or Published	Date Patented or Granted	Priority Claimed?

I hereby claim the benefit under 35 United States Code, §119(e) of any United States provisional application(s) listed below:

Application Number	Filing Date
60/106,034	October 28, 1998
60/106,044	October 28, 1998
60/106,039	October 28, 1998
60/106,042	October 28, 1998
60/106,087	October 29, 1998
60/106,072	October 29, 1998
60/106,073	October 29, 1998
60/106,074	October 29, 1998
60/106,589	November 2, 1998
60/107,034	November 2, 1998
60/107,035	November 2, 1998
60/106.587	November 2, 1998
60/106,588	November 2, 1998

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

PRIOR U.S. OR PCT APPLICATION(S)

Application No.

Filing Date (day/month/year)

Status (pending, abandoned, granted)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following patent agents with full power of substitution, association and revocation to prosecute this application and/or international application and to transact all business in the Patent and Trademark Office connected therewith:

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NO.021 D04

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230

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70

Lys Lys Gln Ser Gly Tyr Arg Ser Pro Pro His Trp Leu Glu Thr Asp

65

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